Mathematical Reasoning

Learn it the Feynman way, then practise it

NSW Selective High School Placement Test · for students in Year 6

10 chapters | **300** questions | **343** min at test pace | answers for **every** question

Each chapter starts by explaining one idea in plain words, shows you the mistake almost everyone makes, and gives you something to remember it by. Then you practise it thirty times.

Phase 0 hand-made sample. All 300 answers were independently re-derived by solver before printing (300/300 passed). Not reviewed by a qualified teacher — year-level appropriateness is unverified. Not for sale.

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CHAPTER 1 OF 10

Percentages of an amount

IN PLAIN WORDS

A percentage is just a fraction with 100 on the bottom. 25% of something is a quarter of it. You never need a calculator if you build the answer out of 10% and 5% and 1%.

EXAMPLE

15% of 240. Ten per cent is 24. Five per cent is half of that, 12. So 15% is 24 + 12 = 36. No long multiplication anywhere.

> COMMON ERROR
>
> Finding 10% by moving the decimal the wrong way. 10% of 240 is 24, not 2400. Ask yourself first whether the answer should be smaller than what you started with. For any percentage under 100, it is.

REMEMBER IT LIKE THIS

Per cent means per hundred. Read it as 'out of every hundred' and the sum tells you what to do.

CHECK YOURSELF

What is 30% of 90? (answer: 27)

1. What is 25% of 120? ZBGGXK

( ) 25 ( ) 12 ( ) 33 ( ) 30

working

2. What is 60% of 240? RDCE38

( ) 24 ( ) 4 ( ) 60 ( ) 144

working

3. What is 75% of 200? MLU7TM

( ) 75 ( ) 153 ( ) 150 ( ) 20

working

4. What is 5% of 120? MDA5HU

( ) 5 ( ) 12 ( ) 6 ( ) 24

working

5. What is 15% of 240? UDZ6YM

( ) 15 ( ) 16 ( ) 24 ( ) 36

working

6. What is 15% of 300? VCKLWN

( ) 45 ( ) 20 ( ) 15 ( ) 30

working

7. What is 60% of 160? G2JJ95

( ) 99 ( ) 60 ( ) 16 ( ) 96

working

8. What is 30% of 160? X7S729

( ) 51 ( ) 16 ( ) 48 ( ) 30

working

9. What is 45% of 400? UNVANK

( ) 40 ( ) 45 ( ) 180 ( ) 183

working

10. What is 35% of 80? FXEWJT

( ) 35 ( ) 31 ( ) 8 ( ) 28

working

11. What is 45% of 80? FK6ETU

( ) 36 ( ) 45 ( ) 39 ( ) 8

working

12. What is 60% of 200? NJVMU3

( ) 20 ( ) 60 ( ) 120 ( ) 123

working

13. What is 45% of 300? E9PU46

( ) 138 ( ) 135 ( ) 45 ( ) 30

working

14. What is 30% of 120? K3ALQ2

( ) 12 ( ) 30 ( ) 4 ( ) 36

working

15. What is 25% of 160? SKAYG4

( ) 40 ( ) 43 ( ) 16 ( ) 25

working

16. What is 35% of 240? EK8W5X

( ) 84 ( ) 87 ( ) 24 ( ) 35

working

17. What is 75% of 240? GZEJNK

( ) 24 ( ) 75 ( ) 183 ( ) 180

working

18. What is 75% of 120? E9X98L

( ) 75 ( ) 12 ( ) 93 ( ) 90

working

19. What is 30% of 80? MFF77B

( ) 24 ( ) 27 ( ) 30 ( ) 8

working

20. What is 35% of 200? NQFLRP

( ) 73 ( ) 35 ( ) 70 ( ) 20

working

21. What is 25% of 80? XCBEE4

( ) 8 ( ) 20 ( ) 25 ( ) 23

working

22. What is 25% of 200? VLFYKE

( ) 20 ( ) 8 ( ) 50 ( ) 25

working

23. What is 75% of 80? KGZ24F

( ) 75 ( ) 60 ( ) 63 ( ) 8

working

24. What is 5% of 240? NQ9PZG

( ) 48 ( ) 5 ( ) 24 ( ) 12

working

25. What is 5% of 200? E64A2D

( ) 20 ( ) 40 ( ) 10 ( ) 5

working

26. What is 75% of 300? YX3APV

( ) 225 ( ) 30 ( ) 4 ( ) 75

working

27. What is 45% of 160? SQGMJY

( ) 75 ( ) 72 ( ) 16 ( ) 45

working

28. What is 35% of 300? TE9AE3

( ) 108 ( ) 35 ( ) 105 ( ) 30

working

29. What is 75% of 400? ZDRPCB

( ) 300 ( ) 40 ( ) 75 ( ) 303

working

30. What is 30% of 300? LCGQX5

( ) 91 ( ) 90 ( ) 10 ( ) 30

working

Chapter 1 — Answers: Percentages of an amount

1. **30**

10% of 120 is 12. 25% is 25 lots of 1%, so 120 x 25 / 100 = 30.

2. **144**

10% of 240 is 24. 60% is 60 lots of 1%, so 240 x 60 / 100 = 144.

3. **150**

10% of 200 is 20. 75% is 75 lots of 1%, so 200 x 75 / 100 = 150.

4. **6**

10% of 120 is 12. 5% is 5 lots of 1%, so 120 x 5 / 100 = 6.

5. **36**

10% of 240 is 24. 15% is 15 lots of 1%, so 240 x 15 / 100 = 36.

6. **45**

10% of 300 is 30. 15% is 15 lots of 1%, so 300 x 15 / 100 = 45.

7. **96**

10% of 160 is 16. 60% is 60 lots of 1%, so 160 x 60 / 100 = 96.

8. **48**

10% of 160 is 16. 30% is 30 lots of 1%, so 160 x 30 / 100 = 48.

9. **180**

10% of 400 is 40. 45% is 45 lots of 1%, so 400 x 45 / 100 = 180.

10. **28**

10% of 80 is 8. 35% is 35 lots of 1%, so 80 x 35 / 100 = 28.

11. **36**

10% of 80 is 8. 45% is 45 lots of 1%, so 80 x 45 / 100 = 36.

12. **120**

10% of 200 is 20. 60% is 60 lots of 1%, so 200 x 60 / 100 = 120.

13. **135**

10% of 300 is 30. 45% is 45 lots of 1%, so 300 x 45 / 100 = 135.

14. **36**

10% of 120 is 12. 30% is 30 lots of 1%, so 120 x 30 / 100 = 36.

15. **40**

10% of 160 is 16. 25% is 25 lots of 1%, so 160 x 25 / 100 = 40.

16. **84**

10% of 240 is 24. 35% is 35 lots of 1%, so 240 x 35 / 100 = 84.

17. **180**

10% of 240 is 24. 75% is 75 lots of 1%, so 240 x 75 / 100 = 180.

18. **90**

10% of 120 is 12. 75% is 75 lots of 1%, so 120 x 75 / 100 = 90.

19. **24**

10% of 80 is 8. 30% is 30 lots of 1%, so 80 x 30 / 100 = 24.

20. **70**

10% of 200 is 20. 35% is 35 lots of 1%, so 200 x 35 / 100 = 70.

21. **20**

10% of 80 is 8. 25% is 25 lots of 1%, so 80 x 25 / 100 = 20.

22. **50**

10% of 200 is 20. 25% is 25 lots of 1%, so 200 x 25 / 100 = 50.

23. **60**

10% of 80 is 8. 75% is 75 lots of 1%, so 80 x 75 / 100 = 60.

24. **12**

10% of 240 is 24. 5% is 5 lots of 1%, so 240 x 5 / 100 = 12.

25. **10**

10% of 200 is 20. 5% is 5 lots of 1%, so 200 x 5 / 100 = 10.

26. **225**

10% of 300 is 30. 75% is 75 lots of 1%, so 300 x 75 / 100 = 225.

27. **72**

10% of 160 is 16. 45% is 45 lots of 1%, so 160 x 45 / 100 = 72.

28. **105**

10% of 300 is 30. 35% is 35 lots of 1%, so 300 x 35 / 100 = 105.

29. **300**

10% of 400 is 40. 75% is 75 lots of 1%, so 400 x 75 / 100 = 300.

30. **90**

10% of 300 is 30. 30% is 30 lots of 1%, so 300 x 30 / 100 = 90.

Increase and decrease

IN PLAIN WORDS

An increase of 20% means you end up with the original PLUS a fifth of it - that is 120% of what you started with. A decrease of 20% leaves you with 80%.

EXAMPLE

A $60 jacket goes up 20%. Twenty per cent of 60 is 12, so the new price is 72. Or straight to it: 120% of 60 = 72.

> COMMON ERROR
>
> Going up 20% and then down 20% and expecting to land back where you started. You do not. 100 goes up to 120, then down 20% of 120 is 24, leaving 96. The percentage is taken of a different number each time.

REMEMBER IT LIKE THIS

A percentage is always a percentage OF something. Change the something and you change the percentage.

CHECK YOURSELF

A $80 bag is reduced by 25%. What is the new price? (answer: $60)

1. A jacket costs $150. The price goes up by 50%. What is the new price? Y4QSR8

( ) $75 ( ) $226 ( ) $225 ( ) $150

working

2. A bag costs $40. It is reduced by 10%. What is the new price? PUUTUY

( ) $40 ( ) $44 ( ) $4 ( ) $36

working

3. A jacket costs $60. The price goes up by 25%. What is the new price? 6B4BDW

( ) $60 ( ) $45 ( ) $75 ( ) $15

working

4. A bag costs $200. It is reduced by 20%. What is the new price? U5Z6FJ

( ) $200 ( ) $40 ( ) $240 ( ) $160

working

5. A jacket costs $50. The price goes up by 20%. What is the new price? MK9Z5P

( ) $40 ( ) $10 ( ) $50 ( ) $60

working

6. A bag costs $100. It is reduced by 10%. What is the new price? 5BNT7V

( ) $110 ( ) $100 ( ) $90 ( ) $10

working

7. A jacket costs $60. The price goes up by 20%. What is the new price? 2QLJFE

( ) $60 ( ) $12 ( ) $48 ( ) $72

working

8. A bag costs $60. It is reduced by 20%. What is the new price? 54Y7HH

( ) $48 ( ) $60 ( ) $12 ( ) $72

working

9. A jacket costs $200. The price goes up by 25%. What is the new price? P5HWNP

( ) $150 ( ) $50 ( ) $200 ( ) $250

working

10. A bag costs $80. It is reduced by 10%. What is the new price? RESRH8

( ) $72 ( ) $80 ( ) $8 ( ) $88

working

11. A jacket costs $50. The price goes up by 10%. What is the new price? S4VSVL

( ) $5 ( ) $45 ( ) $50 ( ) $55

working

12. A bag costs $40. It is reduced by 50%. What is the new price? EA838D

( ) $20 ( ) $21 ( ) $60 ( ) $40

working

13. A jacket costs $120. The price goes up by 50%. What is the new price? Z23ZJP

( ) $180 ( ) $181 ( ) $120 ( ) $60

working

14. A bag costs $40. It is reduced by 25%. What is the new price? 66WSQN

( ) $10 ( ) $40 ( ) $30 ( ) $50

working

15. A jacket costs $60. The price goes up by 10%. What is the new price? 6FY7JH

( ) $60 ( ) $6 ( ) $66 ( ) $54

working

16. A bag costs $80. It is reduced by 20%. What is the new price? HJAD5R

( ) $80 ( ) $16 ( ) $96 ( ) $64

working

17. A jacket costs $150. The price goes up by 20%. What is the new price? XRS2KS

( ) $120 ( ) $180 ( ) $30 ( ) $150

working

18. A bag costs $120. It is reduced by 50%. What is the new price? SP2ZSP

( ) $180 ( ) $61 ( ) $120 ( ) $60

working

19. A jacket costs $40. The price goes up by 20%. What is the new price? JQX5YT

( ) $48 ( ) $40 ( ) $32 ( ) $8

working

20. A bag costs $40. It is reduced by 20%. What is the new price? 45L6JR

( ) $32 ( ) $40 ( ) $8 ( ) $48

working

21. A jacket costs $80. The price goes up by 10%. What is the new price? 9WCVG7

( ) $88 ( ) $8 ( ) $80 ( ) $72

working

22. A bag costs $120. It is reduced by 20%. What is the new price? SZKLQF

( ) $144 ( ) $120 ( ) $96 ( ) $24

working

23. A jacket costs $40. The price goes up by 25%. What is the new price? H48999

( ) $10 ( ) $30 ( ) $40 ( ) $50

working

24. A bag costs $100. It is reduced by 20%. What is the new price? HY57Q8

( ) $100 ( ) $120 ( ) $80 ( ) $20

working

25. A jacket costs $80. The price goes up by 20%. What is the new price? 7JLJWM

( ) $64 ( ) $96 ( ) $80 ( ) $16

working

26. A bag costs $80. It is reduced by 50%. What is the new price? Z9ENAN

( ) $120 ( ) $40 ( ) $80 ( ) $41

working

27. A jacket costs $80. The price goes up by 25%. What is the new price? RGJFAF

( ) $60 ( ) $80 ( ) $20 ( ) $100

working

28. A bag costs $120. It is reduced by 25%. What is the new price? VTDJK5

( ) $90 ( ) $120 ( ) $150 ( ) $30

working

29. A jacket costs $200. The price goes up by 20%. What is the new price? KDRLJL

( ) $200 ( ) $160 ( ) $40 ( ) $240

working

30. A bag costs $200. It is reduced by 10%. What is the new price? YH3GSL

( ) $220 ( ) $180 ( ) $200 ( ) $20

working

Chapter 2 — Answers: Increase and decrease

1. **$225**

50% of 150 is 75. Add it on: 150 + 75 = 225.

2. **$36**

10% of 40 is 4. Take it off: 40 - 4 = 36.

3. **$75**

25% of 60 is 15. Add it on: 60 + 15 = 75.

4. **$160**

20% of 200 is 40. Take it off: 200 - 40 = 160.

5. **$60**

20% of 50 is 10. Add it on: 50 + 10 = 60.

6. **$90**

10% of 100 is 10. Take it off: 100 - 10 = 90.

7. **$72**

20% of 60 is 12. Add it on: 60 + 12 = 72.

8. **$48**

20% of 60 is 12. Take it off: 60 - 12 = 48.

9. **$250**

25% of 200 is 50. Add it on: 200 + 50 = 250.

10. **$72**

10% of 80 is 8. Take it off: 80 - 8 = 72.

11. **$55**

10% of 50 is 5. Add it on: 50 + 5 = 55.

12. **$20**

50% of 40 is 20. Take it off: 40 - 20 = 20.

13. **$180**

50% of 120 is 60. Add it on: 120 + 60 = 180.

14. **$30**

25% of 40 is 10. Take it off: 40 - 10 = 30.

15. **$66**

10% of 60 is 6. Add it on: 60 + 6 = 66.

16. **$64**

20% of 80 is 16. Take it off: 80 - 16 = 64.

17. **$180**

20% of 150 is 30. Add it on: 150 + 30 = 180.

18. **$60**

50% of 120 is 60. Take it off: 120 - 60 = 60.

19. **$48**

20% of 40 is 8. Add it on: 40 + 8 = 48.

20. **$32**

20% of 40 is 8. Take it off: 40 - 8 = 32.

21. **$88**

10% of 80 is 8. Add it on: 80 + 8 = 88.

22. **$96**

20% of 120 is 24. Take it off: 120 - 24 = 96.

23. **$50**

25% of 40 is 10. Add it on: 40 + 10 = 50.

24. **$80**

20% of 100 is 20. Take it off: 100 - 20 = 80.

25. **$96**

20% of 80 is 16. Add it on: 80 + 16 = 96.

26. **$40**

50% of 80 is 40. Take it off: 80 - 40 = 40.

27. **$100**

25% of 80 is 20. Add it on: 80 + 20 = 100.

28. **$90**

25% of 120 is 30. Take it off: 120 - 30 = 90.

29. **$240**

20% of 200 is 40. Add it on: 200 + 40 = 240.

30. **$180**

10% of 200 is 20. Take it off: 200 - 20 = 180.

CHAPTER 3 OF 10

Sharing in a ratio

IN PLAIN WORDS

A ratio tells you how many shares each person gets, not how much. Add the numbers in the ratio to find how many shares there are altogether, then work out what one share is worth.

EXAMPLE

Share $45 in the ratio 2:3. That is 5 shares. One share is 45 / 5 = 9. So the two get 18 and the three get 27. Check: 18 + 27 = 45.

> COMMON ERROR
>
> Dividing by the wrong number - using 2 or 3 instead of 5. The ratio 2:3 does not mean halves or thirds. Always add the parts first.

REMEMBER IT LIKE THIS

A ratio is a recipe. Two cups to three cups makes five cups of mixture, and that total is what you divide up.

CHECK YOURSELF

Share 40 lollies in the ratio 3:5. How many does the larger share get? (answer: 25)

1. 36 counters are shared in the ratio 2:7. How many does the larger share get? BZZGRM

( ) 18 ( ) 28 ( ) 8 ( ) 5

working

2. Red and blue tiles are in the ratio 3:4. There are 36 red tiles. How many blue tiles are there? JERKMJ

( ) 84 ( ) 40 ( ) 36 ( ) 48

working

3. 117 counters are shared in the ratio 2:7. How many does the larger share get? STP7HS

( ) 58 ( ) 91 ( ) 16 ( ) 26

working

4. Red and blue tiles are in the ratio 1:3. There are 7 red tiles. How many blue tiles are there? QTNUNE

( ) 21 ( ) 10 ( ) 7 ( ) 28

working

5. 40 counters are shared in the ratio 3:5. How many does the larger share get? GU6RDD

( ) 15 ( ) 20 ( ) 25 ( ) 8

working

6. Red and blue tiles are in the ratio 2:5. There are 8 red tiles. How many blue tiles are there? FERLVC

( ) 28 ( ) 13 ( ) 8 ( ) 20

working

7. 60 counters are shared in the ratio 2:3. How many does the larger share get? 984K4L

( ) 36 ( ) 20 ( ) 30 ( ) 24

working

8. Red and blue tiles are in the ratio 3:4. There are 9 red tiles. How many blue tiles are there? 8JYXDN

( ) 9 ( ) 13 ( ) 21 ( ) 12

working

9. 91 counters are shared in the ratio 3:4. How many does the larger share get? VEWGTH

( ) 52 ( ) 22 ( ) 45 ( ) 39

working

10. Red and blue tiles are in the ratio 2:5. There are 18 red tiles. How many blue tiles are there? RC4TLK

( ) 23 ( ) 63 ( ) 45 ( ) 18

working

11. 90 counters are shared in the ratio 4:5. How many does the larger share get? KJ6TX9

( ) 50 ( ) 18 ( ) 45 ( ) 40

working

12. Red and blue tiles are in the ratio 4:7. There are 12 red tiles. How many blue tiles are there? L8DKF6

( ) 19 ( ) 12 ( ) 21 ( ) 33

working

13. 75 counters are shared in the ratio 1:4. How many does the larger share get? ZW34FX

( ) 60 ( ) 37 ( ) 15 ( ) 18

working

14. Red and blue tiles are in the ratio 3:4. There are 33 red tiles. How many blue tiles are there? UXJKXA

( ) 44 ( ) 77 ( ) 33 ( ) 37

working

15. 45 counters are shared in the ratio 2:7. How many does the larger share get? RYGEKW

( ) 22 ( ) 6 ( ) 35 ( ) 10

working

16. Red and blue tiles are in the ratio 4:7. There are 28 red tiles. How many blue tiles are there? L8H6XE

( ) 77 ( ) 35 ( ) 28 ( ) 49

working

17. 30 counters are shared in the ratio 1:4. How many does the larger share get? 3Y3DL8

( ) 7 ( ) 6 ( ) 15 ( ) 24

working

18. Red and blue tiles are in the ratio 1:3. There are 5 red tiles. How many blue tiles are there? 3YKCLV

( ) 8 ( ) 15 ( ) 5 ( ) 20

working

19. 63 counters are shared in the ratio 4:5. How many does the larger share get? L58VD8

( ) 35 ( ) 31 ( ) 12 ( ) 28

working

20. Red and blue tiles are in the ratio 2:9. There are 12 red tiles. How many blue tiles are there? 7J3ZSZ

( ) 12 ( ) 21 ( ) 66 ( ) 54

working

21. 120 counters are shared in the ratio 3:5. How many does the larger share get? 68EWT7

( ) 75 ( ) 60 ( ) 24 ( ) 45

working

22. Red and blue tiles are in the ratio 2:5. There are 24 red tiles. How many blue tiles are there? E86Z7W

( ) 84 ( ) 24 ( ) 29 ( ) 60

working

23. 104 counters are shared in the ratio 3:5. How many does the larger share get? AFG6BK

( ) 39 ( ) 20 ( ) 65 ( ) 52

working

24. Red and blue tiles are in the ratio 3:4. There are 27 red tiles. How many blue tiles are there? FL23MD

( ) 36 ( ) 63 ( ) 31 ( ) 27

working

25. 28 counters are shared in the ratio 3:4. How many does the larger share get? ALPV7Y

( ) 7 ( ) 16 ( ) 14 ( ) 12

working

26. Red and blue tiles are in the ratio 1:3. There are 4 red tiles. How many blue tiles are there? MBH5V6

( ) 4 ( ) 12 ( ) 7 ( ) 16

working

27. 108 counters are shared in the ratio 2:7. How many does the larger share get? RZ3CN9

( ) 54 ( ) 24 ( ) 15 ( ) 84

working

28. Red and blue tiles are in the ratio 4:7. There are 48 red tiles. How many blue tiles are there? XGSL4V

( ) 48 ( ) 55 ( ) 132 ( ) 84

working

29. 75 counters are shared in the ratio 2:3. How many does the larger share get? 2YCGKE

( ) 30 ( ) 37 ( ) 45 ( ) 25

working

30. Red and blue tiles are in the ratio 2:9. There are 16 red tiles. How many blue tiles are there? LWLBZA

( ) 88 ( ) 72 ( ) 25 ( ) 16

working

Chapter 3 — Answers: Sharing in a ratio

1. **28**

There are 2 + 7 = 9 shares. One share is 36 / 9 = 4. The larger share is 7 x 4 = 28.

2. **48**

36 red is 3 shares, so one share is 36 / 3 = 12. Blue is 4 shares: 4 x 12 = 48.

3. **91**

There are 2 + 7 = 9 shares. One share is 117 / 9 = 13. The larger share is 7 x 13 = 91.

4. **21**

7 red is 1 shares, so one share is 7 / 1 = 7. Blue is 3 shares: 3 x 7 = 21.

5. **25**

There are 3 + 5 = 8 shares. One share is 40 / 8 = 5. The larger share is 5 x 5 = 25.

6. **20**

8 red is 2 shares, so one share is 8 / 2 = 4. Blue is 5 shares: 5 x 4 = 20.

7. **36**

There are 2 + 3 = 5 shares. One share is 60 / 5 = 12. The larger share is 3 x 12 = 36.

8. **12**

9 red is 3 shares, so one share is 9 / 3 = 3. Blue is 4 shares: 4 x 3 = 12.

9. **52**

There are 3 + 4 = 7 shares. One share is 91 / 7 = 13. The larger share is 4 x 13 = 52.

10. **45**

18 red is 2 shares, so one share is 18 / 2 = 9. Blue is 5 shares: 5 x 9 = 45.

11. **50**

There are 4 + 5 = 9 shares. One share is 90 / 9 = 10. The larger share is 5 x 10 = 50.

12. **21**

12 red is 4 shares, so one share is 12 / 4 = 3. Blue is 7 shares: 7 x 3 = 21.

13. **60**

There are 1 + 4 = 5 shares. One share is 75 / 5 = 15. The larger share is 4 x 15 = 60.

14. **44**

33 red is 3 shares, so one share is 33 / 3 = 11. Blue is 4 shares: 4 x 11 = 44.

15. **35**

There are 2 + 7 = 9 shares. One share is 45 / 9 = 5. The larger share is 7 x 5 = 35.

16. **49**

28 red is 4 shares, so one share is 28 / 4 = 7. Blue is 7 shares: 7 x 7 = 49.

17. **24**

There are 1 + 4 = 5 shares. One share is 30 / 5 = 6. The larger share is 4 x 6 = 24.

18. **15**

5 red is 1 shares, so one share is 5 / 1 = 5. Blue is 3 shares: 3 x 5 = 15.

19. **35**

There are 4 + 5 = 9 shares. One share is 63 / 9 = 7. The larger share is 5 x 7 = 35.

20. **54**

12 red is 2 shares, so one share is 12 / 2 = 6. Blue is 9 shares: 9 x 6 = 54.

21. **75**

There are 3 + 5 = 8 shares. One share is 120 / 8 = 15. The larger share is 5 x 15 = 75.

22. **60**

24 red is 2 shares, so one share is 24 / 2 = 12. Blue is 5 shares: 5 x 12 = 60.

23. **65**

There are 3 + 5 = 8 shares. One share is 104 / 8 = 13. The larger share is 5 x 13 = 65.

24. **36**

27 red is 3 shares, so one share is 27 / 3 = 9. Blue is 4 shares: 4 x 9 = 36.

25. **16**

There are 3 + 4 = 7 shares. One share is 28 / 7 = 4. The larger share is 4 x 4 = 16.

26. **12**

4 red is 1 shares, so one share is 4 / 1 = 4. Blue is 3 shares: 3 x 4 = 12.

27. **84**

There are 2 + 7 = 9 shares. One share is 108 / 9 = 12. The larger share is 7 x 12 = 84.

28. **84**

48 red is 4 shares, so one share is 48 / 4 = 12. Blue is 7 shares: 7 x 12 = 84.

29. **45**

There are 2 + 3 = 5 shares. One share is 75 / 5 = 15. The larger share is 3 x 15 = 45.

30. **72**

16 red is 2 shares, so one share is 16 / 2 = 8. Blue is 9 shares: 9 x 8 = 72.

CHAPTER 4 OF 10

Speed, distance and time

IN PLAIN WORDS

Speed is distance divided by time. Rearranged: distance is speed times time, and time is distance divided by speed. One triangle, three questions.

EXAMPLE

A car travels 180 km in 3 hours. Speed is 180 / 3 = 60 km/h. If it keeps that up for 5 hours it covers 60 x 5 = 300 km.

> COMMON ERROR
>
> Mixing minutes and hours in the same sum. If the speed is in km per HOUR then the time has to be in hours. Thirty minutes is 0.5 hours, not 30.

REMEMBER IT LIKE THIS

Distance is the rectangle: speed along one side, time along the other. Knowing any two gives you the third.

CHECK YOURSELF

A cyclist rides 24 km in 2 hours. What is the speed? (answer: 12 km/h)

1. A car travels 240 km in 4 hours. What is its average speed in km/h? S332VC

( ) 120 ( ) 240 ( ) 960 ( ) 60

working

2. A cyclist rides at 45 km/h for 2 hours. How far do they travel? YYVEGB

( ) 47 ( ) 45 ( ) 90 ( ) 91

working

3. A train covers 45 km at 15 km/h. How many hours does it take? TFNTQA

( ) 45 ( ) 3 ( ) 15 ( ) 6

working

4. A car travels 40 km in 2 hours. What is its average speed in km/h? SHDX2K

( ) 20 ( ) 40 ( ) 21 ( ) 80

working

5. A cyclist rides at 10 km/h for 5 hours. How far do they travel? R8KM9R

( ) 15 ( ) 10 ( ) 25 ( ) 50

working

6. A train covers 120 km at 60 km/h. How many hours does it take? 3FABJR

( ) 4 ( ) 2 ( ) 60 ( ) 120

working

7. A car travels 200 km in 4 hours. What is its average speed in km/h? DP66PE

( ) 200 ( ) 50 ( ) 800 ( ) 100

working

8. A cyclist rides at 30 km/h for 3 hours. How far do they travel? 45J2A9

( ) 33 ( ) 45 ( ) 90 ( ) 30

working

9. A train covers 50 km at 10 km/h. How many hours does it take? EYK2AC

( ) 5 ( ) 10 ( ) 50 ( ) 6

working

10. A car travels 300 km in 5 hours. What is its average speed in km/h? 7JG27B

( ) 120 ( ) 60 ( ) 1500 ( ) 300

working

11. A cyclist rides at 60 km/h for 3 hours. How far do they travel? RNJRLL

( ) 180 ( ) 60 ( ) 90 ( ) 63

working

12. A train covers 80 km at 20 km/h. How many hours does it take? 72WLLW

( ) 8 ( ) 4 ( ) 20 ( ) 80

working

13. A car travels 150 km in 3 hours. What is its average speed in km/h? PG7J2L

( ) 150 ( ) 100 ( ) 450 ( ) 50

working

14. A cyclist rides at 20 km/h for 6 hours. How far do they travel? JQB99M

( ) 20 ( ) 26 ( ) 60 ( ) 120

working

15. A train covers 180 km at 60 km/h. How many hours does it take? 45PNFJ

( ) 180 ( ) 3 ( ) 6 ( ) 60

working

16. A car travels 100 km in 5 hours. What is its average speed in km/h? JMSZRU

( ) 100 ( ) 40 ( ) 500 ( ) 20

working

17. A cyclist rides at 30 km/h for 5 hours. How far do they travel? YF49YD

( ) 35 ( ) 30 ( ) 150 ( ) 75

working

18. A train covers 75 km at 15 km/h. How many hours does it take? 6QCSGK

( ) 15 ( ) 10 ( ) 75 ( ) 5

working

19. A car travels 320 km in 4 hours. What is its average speed in km/h? 9RJQK7

( ) 1280 ( ) 80 ( ) 160 ( ) 320

working

20. A cyclist rides at 45 km/h for 7 hours. How far do they travel? JKS9Y8

( ) 315 ( ) 157 ( ) 52 ( ) 45

working

21. A train covers 180 km at 30 km/h. How many hours does it take? MQANZL

( ) 6 ( ) 30 ( ) 12 ( ) 180

working

22. A car travels 24 km in 2 hours. What is its average speed in km/h? 3C2CTN

( ) 12 ( ) 48 ( ) 24 ( ) 13

working

23. A cyclist rides at 15 km/h for 7 hours. How far do they travel? 22TZKT

( ) 22 ( ) 105 ( ) 15 ( ) 52

working

24. A train covers 60 km at 10 km/h. How many hours does it take? ZABZ3K

( ) 60 ( ) 6 ( ) 12 ( ) 10

working

25. A car travels 180 km in 3 hours. What is its average speed in km/h? VXEP8S

( ) 540 ( ) 60 ( ) 180 ( ) 120

working

26. A cyclist rides at 45 km/h for 5 hours. How far do they travel? GL84GS

( ) 45 ( ) 50 ( ) 225 ( ) 112

working

27. A train covers 50 km at 25 km/h. How many hours does it take? GGJM5J

( ) 4 ( ) 2 ( ) 25 ( ) 50

working

28. A car travels 60 km in 3 hours. What is its average speed in km/h? 8YFAGE

( ) 180 ( ) 20 ( ) 40 ( ) 60

working

29. A cyclist rides at 60 km/h for 5 hours. How far do they travel? VJ9PSX

( ) 150 ( ) 65 ( ) 300 ( ) 60

working

30. A train covers 150 km at 25 km/h. How many hours does it take? 44MPYS

( ) 25 ( ) 150 ( ) 6 ( ) 12

working

Chapter 4 — Answers: Speed, distance and time

1. **60**

Speed is distance divided by time: 240 / 4 = 60 km/h.

2. **90**

Distance is speed times time: 45 x 2 = 90 km.

3. **3**

Time is distance divided by speed: 45 / 15 = 3 hours.

4. **20**

Speed is distance divided by time: 40 / 2 = 20 km/h.

5. **50**

Distance is speed times time: 10 x 5 = 50 km.

6. **2**

Time is distance divided by speed: 120 / 60 = 2 hours.

7. **50**

Speed is distance divided by time: 200 / 4 = 50 km/h.

8. **90**

Distance is speed times time: 30 x 3 = 90 km.

9. **5**

Time is distance divided by speed: 50 / 10 = 5 hours.

10. **60**

Speed is distance divided by time: 300 / 5 = 60 km/h.

11. **180**

Distance is speed times time: 60 x 3 = 180 km.

12. **4**

Time is distance divided by speed: 80 / 20 = 4 hours.

13. **50**

Speed is distance divided by time: 150 / 3 = 50 km/h.

14. **120**

Distance is speed times time: 20 x 6 = 120 km.

15. **3**

Time is distance divided by speed: 180 / 60 = 3 hours.

16. **20**

Speed is distance divided by time: 100 / 5 = 20 km/h.

17. **150**

Distance is speed times time: 30 x 5 = 150 km.

18. **5**

Time is distance divided by speed: 75 / 15 = 5 hours.

19. **80**

Speed is distance divided by time: 320 / 4 = 80 km/h.

20. **315**

Distance is speed times time: 45 x 7 = 315 km.

21. **6**

Time is distance divided by speed: 180 / 30 = 6 hours.

22. **12**

Speed is distance divided by time: 24 / 2 = 12 km/h.

23. **105**

Distance is speed times time: 15 x 7 = 105 km.

24. **6**

Time is distance divided by speed: 60 / 10 = 6 hours.

25. **60**

Speed is distance divided by time: 180 / 3 = 60 km/h.

26. **225**

Distance is speed times time: 45 x 5 = 225 km.

27. **2**

Time is distance divided by speed: 50 / 25 = 2 hours.

28. **20**

Speed is distance divided by time: 60 / 3 = 20 km/h.

29. **300**

Distance is speed times time: 60 x 5 = 300 km.

30. **6**

Time is distance divided by speed: 150 / 25 = 6 hours.

CHAPTER 5 OF 10

Negative numbers

IN PLAIN WORDS

Negative numbers sit to the LEFT of zero on the number line. Adding moves you right, subtracting moves you left. That is the whole rule.

EXAMPLE

Start at −3 and add 7. Move seven steps right: −3, −2, −1, 0, 1, 2, 3, 4. The answer is 4.

> COMMON ERROR
>
> Treating −8 as bigger than −2 because 8 is bigger than 2. It is not. Further left is smaller, so −8 is less than −2. On a cold morning minus eight is the colder one.

REMEMBER IT LIKE THIS

A lift with basement levels. B3 is lower than B1, and going up three floors from B3 lands you at level 0, the ground.

CHECK YOURSELF

What is −5 + 9? (answer: 4)

1. What is −5 + 8? TP25L7

( ) −13 ( ) 13 ( ) 4 ( ) 3

working

2. The temperature rises from −14 degrees to 1 degrees. How many degrees is the rise? AX2Z98

( ) 13 ( ) −13 ( ) 15 ( ) 1

working

3. Which of these is the smallest? −9, 11, −12, −5 6VYQWC

( ) −5 ( ) 11 ( ) −12 ( ) −9

working

4. What is −9 + 5? GD76S8

( ) −14 ( ) −4 ( ) 14 ( ) −3

working

5. The temperature rises from −7 degrees to 7 degrees. How many degrees is the rise? LGUE52

( ) 7 ( ) 0 ( ) 15 ( ) 14

working

6. Which of these is the smallest? 4, −5, −12, −7 E9ULL5

( ) −5 ( ) 4 ( ) −12 ( ) −7

working

7. What is −3 + 5? SLXQNP

( ) 8 ( ) 2 ( ) 3 ( ) −8

working

8. The temperature rises from −2 degrees to 5 degrees. How many degrees is the rise? 94CMBV

( ) 7 ( ) 5 ( ) 3 ( ) −3

working

9. Which of these is the smallest? 11, 8, −12, −5 WG9EP4

( ) −12 ( ) −5 ( ) 8 ( ) 11

working

10. What is −10 + 15? BUQZ59

( ) 6 ( ) −25 ( ) 25 ( ) 5

working

11. The temperature rises from −13 degrees to 11 degrees. How many degrees is the rise? V44E7A

( ) 2 ( ) −2 ( ) 11 ( ) 24

working

12. Which of these is the smallest? −7, −5, 8, −9 Z3MUUD

( ) −5 ( ) −7 ( ) 8 ( ) −9

working

13. What is −12 + 6? F6WDBK

( ) −5 ( ) 18 ( ) −18 ( ) −6

working

14. The temperature rises from −8 degrees to 14 degrees. How many degrees is the rise? Y36F64

( ) −6 ( ) 6 ( ) 22 ( ) 14

working

15. Which of these is the smallest? −12, −3, 6, −9 47AP7C

( ) 6 ( ) −9 ( ) −3 ( ) −12

working

16. What is −4 + 7? 8EFXFD

( ) 4 ( ) 3 ( ) −11 ( ) 11

working

17. The temperature rises from −11 degrees to 5 degrees. How many degrees is the rise? UW5UPN

( ) 6 ( ) −6 ( ) 16 ( ) 5

working

18. Which of these is the smallest? −2, −12, 6, −3 3UTWYQ

( ) 6 ( ) −3 ( ) −12 ( ) −2

working

19. What is −8 + 9? LH74LL

( ) 17 ( ) −17 ( ) 2 ( ) 1

working

20. The temperature rises from −15 degrees to 8 degrees. How many degrees is the rise? U7F52A

( ) 8 ( ) 23 ( ) −7 ( ) 7

working

21. Which of these is the smallest? 11, −12, 8, 4 43EDLB

( ) 11 ( ) −12 ( ) 8 ( ) 4

working

22. What is −12 + 9? DNDBWP

( ) −3 ( ) −21 ( ) −2 ( ) 21

working

23. The temperature rises from −5 degrees to 15 degrees. How many degrees is the rise? ZCN5ZK

( ) 15 ( ) −10 ( ) 10 ( ) 20

working

24. Which of these is the smallest? 4, −9, 8, −7 3HJGAD

( ) 4 ( ) −7 ( ) −9 ( ) 8

working

25. What is −5 + 12? TJBEAA

( ) 7 ( ) 8 ( ) −17 ( ) 17

working

26. The temperature rises from −10 degrees to 11 degrees. How many degrees is the rise? 8YED5A

( ) 21 ( ) −1 ( ) 1 ( ) 11

working

27. Which of these is the smallest? −7, −12, 8, −5 XU9YWN

( ) −12 ( ) 8 ( ) −5 ( ) −7

working

28. What is −12 + 11? 7HA4D8

( ) −23 ( ) 0 ( ) −1 ( ) 23

working

29. The temperature rises from −2 degrees to 3 degrees. How many degrees is the rise? NTT2AX

( ) −1 ( ) 1 ( ) 3 ( ) 5

working

30. Which of these is the smallest? −5, −9, 11, 6 96QMLN

( ) 11 ( ) −9 ( ) 6 ( ) −5

working

Chapter 5 — Answers: Negative numbers

1. **3**

Start at −5 and move 8 steps to the right on the number line. You land on 3.

2. **15**

From −14 up to 0 is 14 degrees, then 0 up to 1 is 1. Altogether 14 + 1 = 15.

3. **−12**

The smallest is the one furthest to the LEFT on the number line. That is −12.

4. **−4**

Start at −9 and move 5 steps to the right on the number line. You land on −4.

5. **14**

From −7 up to 0 is 7 degrees, then 0 up to 7 is 7. Altogether 7 + 7 = 14.

6. **−12**

The smallest is the one furthest to the LEFT on the number line. That is −12.

7. **2**

Start at −3 and move 5 steps to the right on the number line. You land on 2.

8. **7**

From −2 up to 0 is 2 degrees, then 0 up to 5 is 5. Altogether 2 + 5 = 7.

9. **−12**

The smallest is the one furthest to the LEFT on the number line. That is −12.

10. **5**

Start at −10 and move 15 steps to the right on the number line. You land on 5.

11. **24**

From −13 up to 0 is 13 degrees, then 0 up to 11 is 11. Altogether 13 + 11 = 24.

12. **−9**

The smallest is the one furthest to the LEFT on the number line. That is −9.

13. **−6**

Start at −12 and move 6 steps to the right on the number line. You land on −6.

14. **22**

From −8 up to 0 is 8 degrees, then 0 up to 14 is 14. Altogether 8 + 14 = 22.

15. **−12**

The smallest is the one furthest to the LEFT on the number line. That is −12.

16. **3**

Start at −4 and move 7 steps to the right on the number line. You land on 3.

17. **16**

From −11 up to 0 is 11 degrees, then 0 up to 5 is 5. Altogether 11 + 5 = 16.

18. **−12**

The smallest is the one furthest to the LEFT on the number line. That is −12.

19. **1**

Start at −8 and move 9 steps to the right on the number line. You land on 1.

20. **23**

From −15 up to 0 is 15 degrees, then 0 up to 8 is 8. Altogether 15 + 8 = 23.

21. **−12**

The smallest is the one furthest to the LEFT on the number line. That is −12.

22. **−3**

Start at −12 and move 9 steps to the right on the number line. You land on −3.

23. **20**

From −5 up to 0 is 5 degrees, then 0 up to 15 is 15. Altogether 5 + 15 = 20.

24. **−9**

The smallest is the one furthest to the LEFT on the number line. That is −9.

25. **7**

Start at −5 and move 12 steps to the right on the number line. You land on 7.

26. **21**

From −10 up to 0 is 10 degrees, then 0 up to 11 is 11. Altogether 10 + 11 = 21.

27. **−12**

The smallest is the one furthest to the LEFT on the number line. That is −12.

28. **−1**

Start at −12 and move 11 steps to the right on the number line. You land on −1.

29. **5**

From −2 up to 0 is 2 degrees, then 0 up to 3 is 3. Altogether 2 + 3 = 5.

30. **−9**

The smallest is the one furthest to the LEFT on the number line. That is −9.

Letters standing in for numbers

IN PLAIN WORDS

A letter is just a box waiting for a number. If 3n = 21, the letter n must be whatever makes the sentence true, and you find it by undoing what was done to it.

EXAMPLE

3n + 4 = 19. Undo the +4 first: 3n = 15. Then undo the times 3: n = 5. Check by putting 5 back in: 3 x 5 + 4 = 19. Correct.

> COMMON ERROR
>
> Undoing in the order the sentence is written rather than in reverse. Divide by 3 first and you get n + 4 = 6.33, which is a mess. Last thing done, first thing undone - the same rule as working backwards.

REMEMBER IT LIKE THIS

Same socks and shoes. The letter got dressed; you undress it in reverse order.

CHECK YOURSELF

If 4n - 3 = 17, what is n? (answer: 5)

1. If 5n + 9 = 19, what is n? 3TZCLR

( ) 5 ( ) 10 ( ) 2 ( ) 6

working

2. If 6n - 4 = 38, what is n? FRBVDW

( ) 6 ( ) 42 ( ) 7 ( ) 11

working

3. A ticket costs $3 and there is a booking fee of $13 for the whole order. What does an order of 7 tickets cost? KBLA8J

( ) $112 ( ) $34 ( ) $21 ( ) $16

working

4. If 2n + 2 = 26, what is n? AAZVWB

( ) 24 ( ) 13 ( ) 12 ( ) 11

working

5. If 4n - 6 = 6, what is n? GNNDRJ

( ) 12 ( ) 9 ( ) 1 ( ) 3

working

6. A ticket costs $12 and there is a booking fee of $9 for the whole order. What does an order of 3 tickets cost? XFJXA7

( ) $63 ( ) $45 ( ) $36 ( ) $21

working

7. If 2n + 9 = 17, what is n? Y9H46P

( ) 4 ( ) 5 ( ) 8 ( ) 7

working

8. If 2n - 3 = 11, what is n? 76G8QT

( ) 14 ( ) 5 ( ) 7 ( ) 10

working

9. A ticket costs $8 and there is a booking fee of $23 for the whole order. What does an order of 5 tickets cost? QFYL2V

( ) $31 ( ) $40 ( ) $63 ( ) $155

working

10. If 3n + 2 = 29, what is n? PHZB8N

( ) 9 ( ) 13 ( ) 27 ( ) 7

working

11. If 3n - 8 = 28, what is n? K8YQST

( ) 20 ( ) 36 ( ) 12 ( ) 9

working

12. A ticket costs $11 and there is a booking fee of $19 for the whole order. What does an order of 7 tickets cost? 2D4U42

( ) $77 ( ) $96 ( ) $210 ( ) $30

working

13. If 5n + 4 = 19, what is n? 9PAU8Q

( ) 3 ( ) 6 ( ) 15 ( ) 7

working

14. If 6n - 6 = 60, what is n? F68TTH

( ) 66 ( ) 10 ( ) 17 ( ) 11

working

15. A ticket costs $4 and there is a booking fee of $20 for the whole order. What does an order of 7 tickets cost? 9W9ALL

( ) $28 ( ) $24 ( ) $168 ( ) $48

working

16. If 4n + 4 = 52, what is n? 6FQPB9

( ) 48 ( ) 12 ( ) 13 ( ) 9

working

17. If 6n - 2 = 34, what is n? RWV64Z

( ) 5 ( ) 8 ( ) 6 ( ) 36

working

18. A ticket costs $9 and there is a booking fee of $22 for the whole order. What does an order of 4 tickets cost? C5DKCX

( ) $124 ( ) $31 ( ) $58 ( ) $36

working

19. If 2n + 8 = 16, what is n? W75FNU

( ) 8 ( ) 5 ( ) 7 ( ) 4

working

20. If 3n - 11 = 13, what is n? L8PDF4

( ) 8 ( ) 19 ( ) 24 ( ) 4

working

21. A ticket costs $3 and there is a booking fee of $18 for the whole order. What does an order of 5 tickets cost? UJPNEZ

( ) $21 ( ) $15 ( ) $33 ( ) $105

working

22. If 2n + 13 = 27, what is n? PXRPZL

( ) 7 ( ) 11 ( ) 14 ( ) 10

working

23. If 2n - 4 = 22, what is n? GAYUYE

( ) 11 ( ) 13 ( ) 26 ( ) 17

working

24. A ticket costs $8 and there is a booking fee of $25 for the whole order. What does an order of 4 tickets cost? SM9ZUH

( ) $57 ( ) $33 ( ) $32 ( ) $132

working

25. If 4n + 2 = 14, what is n? GGQJB7

( ) 1 ( ) 3 ( ) 12 ( ) 7

working

26. If 4n - 5 = 43, what is n? 96CFQ5

( ) 10 ( ) 48 ( ) 12 ( ) 17

working

27. A ticket costs $10 and there is a booking fee of $24 for the whole order. What does an order of 8 tickets cost? ETPK63

( ) $80 ( ) $34 ( ) $104 ( ) $272

working

28. If 5n + 5 = 20, what is n? BSQVSE

( ) 4 ( ) 15 ( ) 3 ( ) 6

working

29. If 3n - 10 = −1, what is n? NJ95T3

( ) 3 ( ) −1 ( ) 9 ( ) 13

working

30. A ticket costs $10 and there is a booking fee of $8 for the whole order. What does an order of 6 tickets cost? AG5C52

( ) $60 ( ) $108 ( ) $68 ( ) $18

working

Chapter 6 — Answers: Letters standing in for numbers

1. 2

Undo the +9 first: 5n = 19 - 9 = 10. Then undo the times 5: n = 10 / 5 = 2.

2. 7

Add 4 to both sides: 6n = 38 + 4 = 42. Then divide by 6: n = 7.

3. $34

7 tickets cost 7 x 3 = 21. Add the single booking fee: 21 + 13 = 34.

4. 12

Undo the +2 first: 2n = 26 - 2 = 24. Then undo the times 2: n = 24 / 2 = 12.

5. 3

Add 6 to both sides: 4n = 6 + 6 = 12. Then divide by 4: n = 3.

6. $45

3 tickets cost 3 x 12 = 36. Add the single booking fee: 36 + 9 = 45.

7. 4

Undo the +9 first: 2n = 17 - 9 = 8. Then undo the times 2: n = 8 / 2 = 4.

8. 7

Add 3 to both sides: 2n = 11 + 3 = 14. Then divide by 2: n = 7.

9. $63

5 tickets cost 5 x 8 = 40. Add the single booking fee: 40 + 23 = 63.

10. 9

Undo the +2 first: 3n = 29 - 2 = 27. Then undo the times 3: n = 27 / 3 = 9.

11. 12

Add 8 to both sides: 3n = 28 + 8 = 36. Then divide by 3: n = 12.

12. $96

7 tickets cost 7 x 11 = 77. Add the single booking fee: 77 + 19 = 96.

13. 3

Undo the +4 first: 5n = 19 - 4 = 15. Then undo the times 5: n = 15 / 5 = 3.

14. 11

Add 6 to both sides: 6n = 60 + 6 = 66. Then divide by 6: n = 11.

15. $48

7 tickets cost 7 x 4 = 28. Add the single booking fee: 28 + 20 = 48.

16. 12

Undo the +4 first: 4n = 52 - 4 = 48. Then undo the times 4: n = 48 / 4 = 12.

17. 6

Add 2 to both sides: 6n = 34 + 2 = 36. Then divide by 6: n = 6.

18. $58

4 tickets cost 4 x 9 = 36. Add the single booking fee: 36 + 22 = 58.

19. 4

Undo the +8 first: 2n = 16 - 8 = 8. Then undo the times 2: n = 8 / 2 = 4.

20. 8

Add 11 to both sides: 3n = 13 + 11 = 24. Then divide by 3: n = 8.

21. $33

5 tickets cost 5 x 3 = 15. Add the single booking fee: 15 + 18 = 33.

22. **7**

Undo the +13 first: 2n = 27 - 13 = 14. Then undo the times 2: n = 14 / 2 = 7.

23. **13**

Add 4 to both sides: 2n = 22 + 4 = 26. Then divide by 2: n = 13.

24. **$57**

4 tickets cost 4 x 8 = 32. Add the single booking fee: 32 + 25 = 57.

25. **3**

Undo the +2 first: 4n = 14 - 2 = 12. Then undo the times 4: n = 12 / 4 = 3.

26. **12**

Add 5 to both sides: 4n = 43 + 5 = 48. Then divide by 4: n = 12.

27. **$104**

8 tickets cost 8 x 10 = 80. Add the single booking fee: 80 + 24 = 104.

28. **3**

Undo the +5 first: 5n = 20 - 5 = 15. Then undo the times 5: n = 15 / 5 = 3.

29. **3**

Add 10 to both sides: 3n = −1 + 10 = 9. Then divide by 3: n = 3.

30. **$68**

6 tickets cost 6 x 10 = 60. Add the single booking fee: 60 + 8 = 68.

Area of triangles and odd shapes

IN PLAIN WORDS

A triangle is exactly half of the rectangle that would fit around it. So its area is base times height, divided by two. For an odd shape, cut it into rectangles and triangles you already know.

EXAMPLE

A triangle with base 10 and height 6. The rectangle round it would be 60, so the triangle is 30.

> COMMON ERROR
>
> Using a slanted side as the height. The height has to be the straight up-and-down distance from the base to the point, at a right angle. The sloping side is always longer, and using it makes the area too big.

REMEMBER IT LIKE THIS

Cut a rectangle corner to corner and you have two identical triangles. That is where the divide-by-two comes from.

CHECK YOURSELF

A triangle has base 8 cm and height 5 cm. What is its area? (answer: 20 square cm)

1. A triangle has a base of 14 cm and a height of 7 cm. What is its area in square cm? 29Z5VK

( ) 49 ( ) 21 ( ) 42 ( ) 98

working

2. An L-shape is made of two rectangles joined edge to edge. One is 4 cm by 2 cm and the other is 7 cm by 5 cm. What is the total area in square cm? UM6LGK

( ) 8 ( ) 77 ( ) −27 ( ) 43

working

3. A triangle has an area of 14 square cm and a height of 4 cm. What is its base in cm? CM8FWB

( ) 7 ( ) 4 ( ) 14 ( ) 3

working

4. A triangle has a base of 6 cm and a height of 6 cm. What is its area in square cm? AKBKHL

( ) 12 ( ) 18 ( ) 24 ( ) 36

working

5. An L-shape is made of two rectangles joined edge to edge. One is 5 cm by 4 cm and the other is 6 cm by 2 cm. What is the total area in square cm? 6VGFUY

( ) 66 ( ) 8 ( ) 20 ( ) 32

working

6. A triangle has an area of 15 square cm and a height of 6 cm. What is its base in cm? PASK6T

( ) 5 ( ) 2 ( ) 10 ( ) 6

working

7. A triangle has a base of 4 cm and a height of 5 cm. What is its area in square cm? Y6XTZP

( ) 10 ( ) 18 ( ) 9 ( ) 20

working

8. An L-shape is made of two rectangles joined edge to edge. One is 5 cm by 2 cm and the other is 7 cm by 2 cm. What is the total area in square cm? UYV6XC

( ) −4 ( ) 10 ( ) 24 ( ) 48

working

9. A triangle has an area of 36 square cm and a height of 8 cm. What is its base in cm? VLURYZ

( ) 8 ( ) 18 ( ) 9 ( ) 4

working

10. A triangle has a base of 10 cm and a height of 6 cm. What is its area in square cm? 7AP7AK

( ) 60 ( ) 32 ( ) 30 ( ) 16

working

11. An L-shape is made of two rectangles joined edge to edge. One is 7 cm by 3 cm and the other is 6 cm by 2 cm. What is the total area in square cm? TUA8JG

( ) 21 ( ) 9 ( ) 65 ( ) 33

working

12. A triangle has an area of 35 square cm and a height of 10 cm. What is its base in cm? ZD27E5

( ) 3 ( ) 14 ( ) 10 ( ) 7

working

13. A triangle has a base of 4 cm and a height of 11 cm. What is its area in square cm? JLX24J

( ) 44 ( ) 22 ( ) 15 ( ) 30

working

14. An L-shape is made of two rectangles joined edge to edge. One is 3 cm by 3 cm and the other is 3 cm by 2 cm. What is the total area in square cm? BVTCTZ

( ) 30 ( ) 9 ( ) 15 ( ) 3

working

15. A triangle has an area of 27 square cm and a height of 6 cm. What is its base in cm? NZG3MT

( ) 4 ( ) 6 ( ) 9 ( ) 18

working

16. A triangle has a base of 8 cm and a height of 11 cm. What is its area in square cm? 6TNQ3S

( ) 88 ( ) 19 ( ) 38 ( ) 44

working

17. An L-shape is made of two rectangles joined edge to edge. One is 7 cm by 5 cm and the other is 2 cm by 5 cm. What is the total area in square cm? 9BGZSW

( ) 90 ( ) 35 ( ) 45 ( ) 25

working

18. A triangle has an area of 25 square cm and a height of 10 cm. What is its base in cm? WZKEH2

( ) 5 ( ) 6 ( ) 2 ( ) 10

working

19. A triangle has a base of 6 cm and a height of 7 cm. What is its area in square cm? 5LPS33

( ) 26 ( ) 42 ( ) 21 ( ) 13

working

20. An L-shape is made of two rectangles joined edge to edge. One is 3 cm by 5 cm and the other is 4 cm by 2 cm. What is the total area in square cm? SPHVTD

( ) 15 ( ) 7 ( ) 23 ( ) 49

working

21. A triangle has an area of 18 square cm and a height of 4 cm. What is its base in cm? 4KKYJU

( ) 9 ( ) 10 ( ) 4 ( ) 18

working

22. A triangle has a base of 6 cm and a height of 5 cm. What is its area in square cm? JLJKHB

( ) 22 ( ) 11 ( ) 15 ( ) 30

working

23. An L-shape is made of two rectangles joined edge to edge. One is 3 cm by 5 cm and the other is 5 cm by 2 cm. What is the total area in square cm? PN34H3

( ) 25 ( ) 56 ( ) 5 ( ) 15

working

24. A triangle has an area of 45 square cm and a height of 10 cm. What is its base in cm? ELB5XY

( ) 18 ( ) 10 ( ) 9 ( ) 4

working

25. A triangle has a base of 12 cm and a height of 5 cm. What is its area in square cm? TVR2AG

( ) 34 ( ) 17 ( ) 60 ( ) 30

working

26. An L-shape is made of two rectangles joined edge to edge. One is 9 cm by 3 cm and the other is 6 cm by 5 cm. What is the total area in square cm? 6798SN

( ) 57 ( ) −3 ( ) 120 ( ) 27

working

27. A triangle has an area of 60 square cm and a height of 10 cm. What is its base in cm? JLFZE2

( ) 6 ( ) 12 ( ) 10 ( ) 24

working

28. A triangle has a base of 14 cm and a height of 3 cm. What is its area in square cm? N3EQ5V

( ) 34 ( ) 21 ( ) 42 ( ) 17

working

29. An L-shape is made of two rectangles joined edge to edge. One is 4 cm by 2 cm and the other is 3 cm by 4 cm. What is the total area in square cm? JTH7YC

( ) 42 ( ) −4 ( ) 20 ( ) 8

working

30. A triangle has an area of 28 square cm and a height of 8 cm. What is its base in cm? 5A9XP3

( ) 3 ( ) 14 ( ) 8 ( ) 7

working

Chapter 7 — Answers: Area of triangles and odd shapes

1. **49**

The rectangle around it would be 14 x 7 = 98. A triangle is half of that: 49.

2. **43**

Work out each rectangle and add: 4 x 2 = 8 and 7 x 5 = 35. Total 43.

3. **7**

Area is base x height / 2, so base = 2 x area / height = 2 x 14 / 4 = 7.

4. **18**

The rectangle around it would be 6 x 6 = 36. A triangle is half of that: 18.

5. **32**

Work out each rectangle and add: 5 x 4 = 20 and 6 x 2 = 12. Total 32.

6. **5**

Area is base x height / 2, so base = 2 x area / height = 2 x 15 / 6 = 5.

7. **10**

The rectangle around it would be 4 x 5 = 20. A triangle is half of that: 10.

8. **24**

Work out each rectangle and add: 5 x 2 = 10 and 7 x 2 = 14. Total 24.

9. **9**

Area is base x height / 2, so base = 2 x area / height = 2 x 36 / 8 = 9.

10. **30**

The rectangle around it would be 10 x 6 = 60. A triangle is half of that: 30.

11. **33**

Work out each rectangle and add: 7 x 3 = 21 and 6 x 2 = 12. Total 33.

12. **7**

Area is base x height / 2, so base = 2 x area / height = 2 x 35 / 10 = 7.

13. **22**

The rectangle around it would be 4 x 11 = 44. A triangle is half of that: 22.

14. **15**

Work out each rectangle and add: 3 x 3 = 9 and 3 x 2 = 6. Total 15.

15. **9**

Area is base x height / 2, so base = 2 x area / height = 2 x 27 / 6 = 9.

16. **44**

The rectangle around it would be 8 x 11 = 88. A triangle is half of that: 44.

17. **45**

Work out each rectangle and add: 7 x 5 = 35 and 2 x 5 = 10. Total 45.

18. **5**

Area is base x height / 2, so base = 2 x area / height = 2 x 25 / 10 = 5.

19. **21**

The rectangle around it would be 6 x 7 = 42. A triangle is half of that: 21.

20. **23**

Work out each rectangle and add: 3 x 5 = 15 and 4 x 2 = 8. Total 23.

21. **9**

Area is base x height / 2, so base = 2 x area / height = 2 x 18 / 4 = 9.

22. **15**

The rectangle around it would be 6 x 5 = 30. A triangle is half of that: 15.

23. **25**

Work out each rectangle and add: 3 x 5 = 15 and 5 x 2 = 10. Total 25.

24. **9**

Area is base x height / 2, so base = 2 x area / height = 2 x 45 / 10 = 9.

25. **30**

The rectangle around it would be 12 x 5 = 60. A triangle is half of that: 30.

26. **57**

Work out each rectangle and add: 9 x 3 = 27 and 6 x 5 = 30. Total 57.

27. **12**

Area is base x height / 2, so base = 2 x area / height = 2 x 60 / 10 = 12.

28. **21**

The rectangle around it would be 14 x 3 = 42. A triangle is half of that: 21.

29. **20**

Work out each rectangle and add: 4 x 2 = 8 and 3 x 4 = 12. Total 20.

30. **7**

Area is base x height / 2, so base = 2 x area / height = 2 x 28 / 8 = 7.

How likely is it?

IN PLAIN WORDS

Probability is the number of ways you can win, over the number of things that could happen. Both counted the same way, both counted fairly.

EXAMPLE

A bag holds 3 red and 5 blue marbles. Eight marbles altogether, three of them red, so the chance of red is 3/8.

> COMMON ERROR
>
> Writing the chance as wins-to-losses instead of wins-out-of-total. Three red and five blue is not a 3/5 chance of red. It is 3 out of 8, because there are eight marbles you might pull out.

REMEMBER IT LIKE THIS

Slices of a pie. The chance is how much of the whole pie your slices cover.

CHECK YOURSELF

A bag has 2 green and 6 yellow counters. What is the chance of green? (answer: 2/8, which is 1/4)

1. A bag holds 1 red marbles and 3 blue marbles. One marble is taken without looking. What is the chance it is red? 3XPBCD

( ) 3/4 ( ) 1/4 ( ) 4/1 ( ) 1/3

working

2. A bag holds 7 green counters and 4 yellow counters. What is the chance of NOT picking green? LMZPL5

( ) 4/7 ( ) 11/4 ( ) 7/11 ( ) 4/11

working

3. A spinner has 24 equal sections. 4 of them are starred. How many sections are NOT starred? QE46QX

( ) 20 ( ) 28 ( ) 4 ( ) 24

working

4. A bag holds 6 red marbles and 3 blue marbles. One marble is taken without looking. What is the chance it is red? 447B36

( ) 6/3 ( ) 6/9 ( ) 3/9 ( ) 9/6

working

5. A bag holds 7 green counters and 8 yellow counters. What is the chance of NOT picking green? ME6PWC

( ) 15/8 ( ) 8/15 ( ) 7/15 ( ) 8/7

working

6. A spinner has 9 equal sections. 3 of them are starred. How many sections are NOT starred? BMEV7Y

( ) 3 ( ) 12 ( ) 9 ( ) 6

working

7. A bag holds 4 red marbles and 6 blue marbles. One marble is taken without looking. What is the chance it is red? EHPMEQ

( ) 10/4 ( ) 4/10 ( ) 4/6 ( ) 6/10

working

8. A bag holds 2 green counters and 4 yellow counters. What is the chance of NOT picking green? K7GYVT

( ) 2/6 ( ) 6/4 ( ) 4/2 ( ) 4/6

working

9. A spinner has 10 equal sections. 2 of them are starred. How many sections are NOT starred? BK9C73

( ) 10 ( ) 12 ( ) 8 ( ) 2

working

10. A bag holds 2 red marbles and 6 blue marbles. One marble is taken without looking. What is the chance it is red? XLQXVT

( ) 6/8 ( ) 2/8 ( ) 8/2 ( ) 2/6

working

11. A bag holds 2 green counters and 8 yellow counters. What is the chance of NOT picking green? WP2JPK

( ) 8/2 ( ) 8/10 ( ) 2/10 ( ) 10/8

working

12. A spinner has 12 equal sections. 3 of them are starred. How many sections are NOT starred? 3VNNBH

( ) 12 ( ) 15 ( ) 3 ( ) 9

working

13. A bag holds 4 red marbles and 2 blue marbles. One marble is taken without looking. What is the chance it is red? VMD83C

( ) 2/6 ( ) 4/2 ( ) 4/6 ( ) 6/4

working

14. A bag holds 7 green counters and 5 yellow counters. What is the chance of NOT picking green? QFDZDM

( ) 5/12 ( ) 12/5 ( ) 5/7 ( ) 7/12

working

15. A spinner has 12 equal sections. 2 of them are starred. How many sections are NOT starred? Z4BLFH

( ) 14 ( ) 10 ( ) 2 ( ) 12

working

16. A bag holds 4 red marbles and 7 blue marbles. One marble is taken without looking. What is the chance it is red? N37V6W

( ) 11/4 ( ) 7/11 ( ) 4/7 ( ) 4/11

working

17. A bag holds 3 green counters and 8 yellow counters. What is the chance of NOT picking green? WSHZ3J

( ) 11/8 ( ) 8/11 ( ) 3/11 ( ) 8/3

working

18. A spinner has 20 equal sections. 4 of them are starred. How many sections are NOT starred? V572EX

( ) 4 ( ) 16 ( ) 24 ( ) 20

working

19. A bag holds 5 red marbles and 8 blue marbles. One marble is taken without looking. What is the chance it is red? E6TBFR

( ) 5/13 ( ) 5/8 ( ) 13/5 ( ) 8/13

working

20. A bag holds 2 green counters and 6 yellow counters. What is the chance of NOT picking green? 7UX7A7

( ) 6/8 ( ) 6/2 ( ) 2/8 ( ) 8/6

working

21. A spinner has 8 equal sections. 2 of them are starred. How many sections are NOT starred? GJZT8V

( ) 8 ( ) 6 ( ) 10 ( ) 2

working

22. A bag holds 5 red marbles and 4 blue marbles. One marble is taken without looking. What is the chance it is red? LYMA9S

( ) 5/4 ( ) 9/5 ( ) 5/9 ( ) 4/9

working

23. A bag holds 6 green counters and 5 yellow counters. What is the chance of NOT picking green? 7AY8QR

( ) 11/5 ( ) 5/6 ( ) 6/11 ( ) 5/11

working

24. A spinner has 30 equal sections. 5 of them are starred. How many sections are NOT starred? G5MEWY

( ) 5 ( ) 30 ( ) 25 ( ) 35

working

25. A bag holds 1 red marbles and 6 blue marbles. One marble is taken without looking. What is the chance it is red? 55WMYM

( ) 7/1 ( ) 1/7 ( ) 6/7 ( ) 1/6

working

26. A bag holds 6 green counters and 8 yellow counters. What is the chance of NOT picking green? G8DRJU

( ) 14/8 ( ) 6/14 ( ) 8/6 ( ) 8/14

working

27. A spinner has 16 equal sections. 4 of them are starred. How many sections are NOT starred? QV8KT3

( ) 4 ( ) 12 ( ) 20 ( ) 16

working

28. A bag holds 2 red marbles and 7 blue marbles. One marble is taken without looking. What is the chance it is red? RW6PEG

( ) 2/7 ( ) 7/9 ( ) 2/9 ( ) 9/2

working

29. A bag holds 3 green counters and 4 yellow counters. What is the chance of NOT picking green? NTCDGD

( ) 4/3 ( ) 3/7 ( ) 4/7 ( ) 7/4

working

30. A spinner has 15 equal sections. 5 of them are starred. How many sections are NOT starred? 6H8FXJ

( ) 15 ( ) 10 ( ) 20 ( ) 5

working

Chapter 8 — Answers: How likely is it?

1. **1/4**

There are 4 marbles altogether and 1 of them are red, so the chance is 1/4.

2. **4/11**

Not green means yellow. There are 4 yellow out of 11, so the chance is 4/11.

3. **20**

24 sections in all, 4 starred, so 24 - 4 = 20 are not.

4. **6/9**

There are 9 marbles altogether and 6 of them are red, so the chance is 6/9.

5. **8/15**

Not green means yellow. There are 8 yellow out of 15, so the chance is 8/15.

6. **6**

9 sections in all, 3 starred, so 9 - 3 = 6 are not.

7. **4/10**

There are 10 marbles altogether and 4 of them are red, so the chance is 4/10.

8. **4/6**

Not green means yellow. There are 4 yellow out of 6, so the chance is 4/6.

9. **8**

10 sections in all, 2 starred, so 10 - 2 = 8 are not.

10. **2/8**

There are 8 marbles altogether and 2 of them are red, so the chance is 2/8.

11. **8/10**

Not green means yellow. There are 8 yellow out of 10, so the chance is 8/10.

12. **9**

12 sections in all, 3 starred, so 12 - 3 = 9 are not.

13. **4/6**

There are 6 marbles altogether and 4 of them are red, so the chance is 4/6.

14. **5/12**

Not green means yellow. There are 5 yellow out of 12, so the chance is 5/12.

15. **10**

12 sections in all, 2 starred, so 12 - 2 = 10 are not.

16. **4/11**

There are 11 marbles altogether and 4 of them are red, so the chance is 4/11.

17. **8/11**

Not green means yellow. There are 8 yellow out of 11, so the chance is 8/11.

18. **16**

20 sections in all, 4 starred, so 20 - 4 = 16 are not.

19. **5/13**

There are 13 marbles altogether and 5 of them are red, so the chance is 5/13.

20. **6/8**

Not green means yellow. There are 6 yellow out of 8, so the chance is 6/8.

21. **6**

8 sections in all, 2 starred, so 8 - 2 = 6 are not.

22. **5/9**

There are 9 marbles altogether and 5 of them are red, so the chance is 5/9.

23. **5/11**

Not green means yellow. There are 5 yellow out of 11, so the chance is 5/11.

24. **25**

30 sections in all, 5 starred, so 30 - 5 = 25 are not.

25. **1/7**

There are 7 marbles altogether and 1 of them are red, so the chance is 1/7.

26. **8/14**

Not green means yellow. There are 8 yellow out of 14, so the chance is 8/14.

27. **12**

16 sections in all, 4 starred, so 16 - 4 = 12 are not.

28. **2/9**

There are 9 marbles altogether and 2 of them are red, so the chance is 2/9.

29. **4/7**

Not green means yellow. There are 4 yellow out of 7, so the chance is 4/7.

30. **10**

15 sections in all, 5 starred, so 15 - 5 = 10 are not.

Two-step word problems

IN PLAIN WORDS

A two-step problem hides a number you are not asked for. Find that one first, then answer the actual question.

EXAMPLE

Tickets cost $12. A group buys 8 and pays with $200. The hidden number is the total cost, 96. Only then can you find the change, which is 104.

> COMMON ERROR
>
> Answering the hidden step and stopping. You worked out 96 and it felt like an answer, so you wrote it down. Reread the question - it asked for the change.

REMEMBER IT LIKE THIS

It is a door with two locks. Getting the first one open is not the same as being through.

CHECK YOURSELF

Pens cost $3 each. Sam buys 7 and pays with $50. What is the change? (answer: $29)

1. Pens cost $12 each. Sam buys 8 and pays with $200. How much change does Sam get? ADGHJH

( ) $104 ( ) $96 ( ) $188 ( ) $296

working

2. A tank holds 240 litres. A gardener uses a third of it, then another 38 litres. How many litres are left? MPKQSW

( ) 122 ( ) 160 ( ) 202 ( ) 118

working

3. A machine makes 4 parts an hour. It runs for 7 hours, and 19 parts were already in the box. How many parts are there now? 6E2SJJ

( ) 161 ( ) 47 ( ) 11 ( ) 28

working

4. Pens cost $7 each. Sam buys 5 and pays with $100. How much change does Sam get? SAWELT

( ) $135 ( ) $65 ( ) $35 ( ) $93

working

5. A tank holds 120 litres. A gardener uses a third of it, then another 31 litres. How many litres are left? V2DPE4

( ) 49 ( ) 89 ( ) 71 ( ) 80

working

6. A machine makes 8 parts an hour. It runs for 7 hours, and 27 parts were already in the box. How many parts are there now? 3SM3T7

( ) 83 ( ) 15 ( ) 245 ( ) 56

working

7. Pens cost $10 each. Sam buys 6 and pays with $200. How much change does Sam get? T29VMM

( ) $260 ( ) $190 ( ) $60 ( ) $140

working

8. A tank holds 200 litres. A gardener uses a half of it, then another 18 litres. How many litres are left? RZ7MZC

( ) 100 ( ) 82 ( ) 118 ( ) 182

working

9. A machine makes 11 parts an hour. It runs for 6 hours, and 20 parts were already in the box. How many parts are there now? ANTXHG

( ) 17 ( ) 186 ( ) 66 ( ) 86

working

10. Pens cost $4 each. Sam buys 4 and pays with $200. How much change does Sam get? ZWQFWV

( ) $184 ( ) $216 ( ) $196 ( ) $16

working

11. A tank holds 150 litres. A gardener uses a half of it, then another 34 litres. How many litres are left? T2PGP2

( ) 116 ( ) 109 ( ) 41 ( ) 75

working

12. A machine makes 11 parts an hour. It runs for 7 hours, and 21 parts were already in the box. How many parts are there now? GS97GS

( ) 77 ( ) 224 ( ) 18 ( ) 98

working

13. Pens cost $15 each. Sam buys 6 and pays with $200. How much change does Sam get? R7N7YB

( ) $110 ( ) $290 ( ) $90 ( ) $185

working

14. A tank holds 150 litres. A gardener uses a half of it, then another 28 litres. How many litres are left? G5F2E2

( ) 75 ( ) 103 ( ) 47 ( ) 122

working

15. A machine makes 7 parts an hour. It runs for 8 hours, and 11 parts were already in the box. How many parts are there now? LQXSXB

( ) 56 ( ) 15 ( ) 67 ( ) 144

working

16. Pens cost $8 each. Sam buys 9 and pays with $100. How much change does Sam get? R9RJPN

( ) $72 ( ) $172 ( ) $92 ( ) $28

working

17. A tank holds 120 litres. A gardener uses a quarter of it, then another 32 litres. How many litres are left? ZTWZFE

( ) 88 ( ) 90 ( ) 58 ( ) 62

working

18. A machine makes 5 parts an hour. It runs for 4 hours, and 29 parts were already in the box. How many parts are there now? 9HJPQQ

( ) 9 ( ) 49 ( ) 20 ( ) 136

working

19. Pens cost $7 each. Sam buys 9 and pays with $100. How much change does Sam get? XWFGQT

( ) $163 ( ) $37 ( ) $63 ( ) $93

working

20. A tank holds 200 litres. A gardener uses a fifth of it, then another 19 litres. How many litres are left? D75E4L

( ) 181 ( ) 59 ( ) 160 ( ) 141

working

21. A machine makes 9 parts an hour. It runs for 5 hours, and 6 parts were already in the box. How many parts are there now? V5HQGE

( ) 75 ( ) 45 ( ) 51 ( ) 14

working

22. Pens cost $9 each. Sam buys 7 and pays with $200. How much change does Sam get? CYE2R6

( ) $137 ( ) $63 ( ) $191 ( ) $263

working

23. A tank holds 120 litres. A gardener uses a fifth of it, then another 38 litres. How many litres are left? VFNXNN

( ) 82 ( ) 96 ( ) 62 ( ) 58

working

24. A machine makes 8 parts an hour. It runs for 5 hours, and 5 parts were already in the box. How many parts are there now? UUHVLW

( ) 65 ( ) 13 ( ) 45 ( ) 40

working

25. Pens cost $15 each. Sam buys 5 and pays with $200. How much change does Sam get? FSMZBV

( ) $275 ( ) $125 ( ) $185 ( ) $75

working

26. A tank holds 200 litres. A gardener uses a fifth of it, then another 18 litres. How many litres are left? 2YFQF3

( ) 58 ( ) 142 ( ) 160 ( ) 182

working

27. A machine makes 15 parts an hour. It runs for 3 hours, and 14 parts were already in the box. How many parts are there now? BXKBT7

( ) 45 ( ) 87 ( ) 18 ( ) 59

working

28. Pens cost $9 each. Sam buys 4 and pays with $100. How much change does Sam get? 39NN92

( ) $36 ( ) $136 ( ) $91 ( ) $64

working

29. A tank holds 300 litres. A gardener uses a quarter of it, then another 28 litres. How many litres are left? 9HD6YZ

( ) 272 ( ) 225 ( ) 197 ( ) 103

working

30. A machine makes 10 parts an hour. It runs for 4 hours, and 6 parts were already in the box. How many parts are there now? 65JV7M

( ) 64 ( ) 14 ( ) 40 ( ) 46

working

Chapter 9 — Answers: Two-step word problems

1. **$104**

The pens cost 8 x 12 = 96. Change is 200 - 96 = 104.

2. **122**

A third of 240 is 80. Used altogether: 80 + 38 = 118. Left: 240 - 118 = 122.

3. **47**

The machine makes 4 x 7 = 28. With the 19 already there: 47.

4. **$65**

The pens cost 5 x 7 = 35. Change is 100 - 35 = 65.

5. **49**

A third of 120 is 40. Used altogether: 40 + 31 = 71. Left: 120 - 71 = 49.

6. **83**

The machine makes 8 x 7 = 56. With the 27 already there: 83.

7. **$140**

The pens cost 6 x 10 = 60. Change is 200 - 60 = 140.

8. **82**

A half of 200 is 100. Used altogether: 100 + 18 = 118. Left: 200 - 118 = 82.

9. **86**

The machine makes 11 x 6 = 66. With the 20 already there: 86.

10. **$184**

The pens cost 4 x 4 = 16. Change is 200 - 16 = 184.

11. **41**

A half of 150 is 75. Used altogether: 75 + 34 = 109. Left: 150 - 109 = 41.

12. **98**

The machine makes 11 x 7 = 77. With the 21 already there: 98.

13. **$110**

The pens cost 6 x 15 = 90. Change is 200 - 90 = 110.

14. **47**

A half of 150 is 75. Used altogether: 75 + 28 = 103. Left: 150 - 103 = 47.

15. **67**

The machine makes 7 x 8 = 56. With the 11 already there: 67.

16. **$28**

The pens cost 9 x 8 = 72. Change is 100 - 72 = 28.

17. **58**

A quarter of 120 is 30. Used altogether: 30 + 32 = 62. Left: 120 - 62 = 58.

18. **49**

The machine makes 5 x 4 = 20. With the 29 already there: 49.

19. **$37**

The pens cost 9 x 7 = 63. Change is 100 - 63 = 37.

20. **141**

A fifth of 200 is 40. Used altogether: 40 + 19 = 59. Left: 200 - 59 = 141.

21. **51**

The machine makes 9 x 5 = 45. With the 6 already there: 51.

22. **$137**

The pens cost 7 x 9 = 63. Change is 200 - 63 = 137.

23. **58**

A fifth of 120 is 24. Used altogether: 24 + 38 = 62. Left: 120 - 62 = 58.

24. **45**

The machine makes 8 x 5 = 40. With the 5 already there: 45.

25. **$125**

The pens cost 5 x 15 = 75. Change is 200 - 75 = 125.

26. **142**

A fifth of 200 is 40. Used altogether: 40 + 18 = 58. Left: 200 - 58 = 142.

27. **59**

The machine makes 15 x 3 = 45. With the 14 already there: 59.

28. **$64**

The pens cost 4 x 9 = 36. Change is 100 - 36 = 64.

29. **197**

A quarter of 300 is 75. Used altogether: 75 + 28 = 103. Left: 300 - 103 = 197.

30. **46**

The machine makes 10 x 4 = 40. With the 6 already there: 46.

Harder patterns

IN PLAIN WORDS

When the gaps are not equal, look at the gaps BETWEEN the gaps, or test a two-part rule like ‘times something, then add something’.

EXAMPLE

3, 7, 15, 31. The gaps are 4, 8, 16 - doubling. So the rule is ‘double it, then add 1’. Test every step: 3x2+1 = 7, 7x2+1 = 15, 15x2+1 = 31. All four fit.

COMMON ERROR

Stopping at the first rule that fits the first two numbers. Lots of rules fit two numbers. Only one usually fits all four, so always check the rule against the whole sequence before using it.

REMEMBER IT LIKE THIS

A key that turns in the first lock is not the right key if it jams in the second.

CHECK YOURSELF

2, 5, 11, 23. What is the rule? (answer: double it, then add 1)

1. What comes next? 10, 24, 52, 108 YWKHPN

( ) 164 ( ) 216 ( ) 220 ( ) 112

working

2. What comes next? 16, 25, 36, 49 TT5V44

( ) 98 ( ) 64 ( ) 62 ( ) 53

working

3. What comes next? 3, 9, 7, 13 C8AX27

( ) 11 ( ) 7 ( ) 19 ( ) 15

working

4. What comes next? 9, 20, 42, 86 CBMZF5

( ) 88 ( ) 130 ( ) 174 ( ) 172

working

5. What comes next? 144, 169, 196, 225 WDVKUZ

( ) 254 ( ) 237 ( ) 450 ( ) 256

working

6. What comes next? 9, 17, 14, 22 XQZSX8

( ) 30 ( ) 25 ( ) 14 ( ) 19

working

7. What comes next? 11, 26, 56, 116 7GSKCA

( ) 232 ( ) 236 ( ) 120 ( ) 176

working

8. What comes next? 169, 196, 225, 256 6GMM3T

( ) 269 ( ) 512 ( ) 289 ( ) 287

working

9. What comes next? 10, 14, 11, 15 5MJXF8

( ) 19 ( ) 12 ( ) 18 ( ) 11

working

10. What comes next? 3, 9, 21, 45 CTNAMM

( ) 93 ( ) 69 ( ) 90 ( ) 48

working

11. What comes next? 4, 9, 16, 25 W4K3N6

( ) 50 ( ) 34 ( ) 27 ( ) 36

working

12. What comes next? 8, 12, 9, 13 ZGVCPA

( ) 10 ( ) 16 ( ) 9 ( ) 17

working

13. What comes next? 8, 18, 38, 78 FU3SET

( ) 156 ( ) 158 ( ) 118 ( ) 80

working

14. What comes next? 121, 144, 169, 196 CYBY9Z

( ) 223 ( ) 225 ( ) 207 ( ) 392

working

15. What comes next? 8, 15, 12, 19 JQE9C9

( ) 26 ( ) 12 ( ) 16 ( ) 22

working

16. What comes next? 6, 15, 33, 69 HFJVEQ

( ) 141 ( ) 72 ( ) 105 ( ) 138

working

17. What comes next? 81, 100, 121, 144 TYLU4E

( ) 167 ( ) 288 ( ) 153 ( ) 169

working

18. What comes next? 8, 13, 11, 16 GT7S3E

( ) 11 ( ) 18 ( ) 14 ( ) 21

working

19. What comes next? 2, 6, 14, 30 PTM76W

( ) 46 ( ) 32 ( ) 62 ( ) 60

working

20. What comes next? 36, 49, 64, 81 UPCT7N

( ) 100 ( ) 162 ( ) 98 ( ) 87

working

21. What comes next? 10, 17, 15, 22 8CJKE2

( ) 29 ( ) 24 ( ) 20 ( ) 15

working

22. What comes next? 3, 10, 24, 52 ZMTH5G

( ) 104 ( ) 108 ( ) 80 ( ) 56

working

23. What comes next? 25, 36, 49, 64 DNB9VR

( ) 128 ( ) 79 ( ) 69 ( ) 81

working

24. What comes next? 9, 15, 13, 19 6GCLJK

( ) 17 ( ) 13 ( ) 21 ( ) 25

working

25. What comes next? 10, 22, 46, 94 QRZED2

( ) 190 ( ) 142 ( ) 188 ( ) 96

working

26. What comes next? 1, 4, 9, 16 CFYD5C

( ) 25 ( ) 17 ( ) 32 ( ) 23

working

27. What comes next? 10, 16, 14, 20 XNDU55

( ) 22 ( ) 26 ( ) 14 ( ) 18

working

28. What comes next? 11, 24, 50, 102 NDNMUK

( ) 206 ( ) 204 ( ) 104 ( ) 154

working

29. What comes next? 100, 121, 144, 169 3C97JD

( ) 338 ( ) 196 ( ) 179 ( ) 194

working

30. What comes next? 6, 10, 8, 12 XT85Z8

( ) 14 ( ) 16 ( ) 8 ( ) 10

working

Chapter 10 — Answers: Harder patterns

1. **220**

Each term is double the one before, plus 4. Check: 10x2+4 = 24, 24x2+4 = 52. So next is 108x2+4 = 220.

2. **64**

These are square numbers: 4x4=16, 5x5=25, 6x6=36, 7x7=49. Next is 8x8 = 64.

3. **11**

The rule alternates: add 6, then take away 2. The last step was an add, so next you take away 2: 11.

4. **174**

Each term is double the one before, plus 2. Check: 9x2+2 = 20, 20x2+2 = 42. So next is 86x2+2 = 174.

5. **256**

These are square numbers: 12x12=144, 13x13=169, 14x14=196, 15x15=225. Next is 16x16 = 256.

6. **19**

The rule alternates: add 8, then take away 3. The last step was an add, so next you take away 3: 19.

7. **236**

Each term is double the one before, plus 4. Check: 11x2+4 = 26, 26x2+4 = 56. So next is 116x2+4 = 236.

8. **289**

These are square numbers: 13x13=169, 14x14=196, 15x15=225, 16x16=256. Next is 17x17 = 289.

9. **12**

The rule alternates: add 4, then take away 3. The last step was an add, so next you take away 3: 12.

10. **93**

Each term is double the one before, plus 3. Check: 3x2+3 = 9, 9x2+3 = 21. So next is 45x2+3 = 93.

11. **36**

These are square numbers: 2x2=4, 3x3=9, 4x4=16, 5x5=25. Next is 6x6 = 36.

12. **10**

The rule alternates: add 4, then take away 3. The last step was an add, so next you take away 3: 10.

13. **158**

Each term is double the one before, plus 2. Check: 8x2+2 = 18, 18x2+2 = 38. So next is 78x2+2 = 158.

14. **225**

These are square numbers: 11x11=121, 12x12=144, 13x13=169, 14x14=196. Next is 15x15 = 225.

15. **16**

The rule alternates: add 7, then take away 3. The last step was an add, so next you take away 3: 16.

16. **141**

Each term is double the one before, plus 3. Check: 6x2+3 = 15, 15x2+3 = 33. So next is 69x2+3 = 141.

17. **169**

These are square numbers: 9x9=81, 10x10=100, 11x11=121, 12x12=144. Next is 13x13 = 169.

18. **14**

The rule alternates: add 5, then take away 2. The last step was an add, so next you take away 2: 14.

19. **62**

Each term is double the one before, plus 2. Check: 2x2+2 = 6, 6x2+2 = 14. So next is 30x2+2 = 62.

20. **100**

These are square numbers: 6x6=36, 7x7=49, 8x8=64, 9x9=81. Next is 10x10 = 100.

21. **20**

The rule alternates: add 7, then take away 2. The last step was an add, so next you take away 2: 20.

22. **108**

Each term is double the one before, plus 4. Check: 3x2+4 = 10, 10x2+4 = 24. So next is 52x2+4 = 108.

23. **81**

These are square numbers: 5x5=25, 6x6=36, 7x7=49, 8x8=64. Next is 9x9 = 81.

24. **17**

The rule alternates: add 6, then take away 2. The last step was an add, so next you take away 2: 17.

25. **190**

Each term is double the one before, plus 2. Check: 10x2+2 = 22, 22x2+2 = 46. So next is 94x2+2 = 190.

26. **25**

These are square numbers: 1x1=1, 2x2=4, 3x3=9, 4x4=16. Next is 5x5 = 25.

27. **18**

The rule alternates: add 6, then take away 2. The last step was an add, so next you take away 2: 18.

28. **206**

Each term is double the one before, plus 2. Check: 11x2+2 = 24, 24x2+2 = 50. So next is 102x2+2 = 206.

29. **196**

These are square numbers: 10x10=100, 11x11=121, 12x12=144, 13x13=169. Next is 14x14 = 196.

30. **10**

The rule alternates: add 4, then take away 2. The last step was an add, so next you take away 2: 10.