nexamind EDUCATION

Name _____ Date _____

12.3 Direct proportion — worked answers

Recognise direct proportion and solve problems with it, using the unitary method. · 43 questions

A · Fluency — Find one, then scale up.

1 3 pens cost $12. What do 5 pens cost, in dollars?

Answer: 20

One pen costs 12 ÷ 3 = 4, so 5 pens cost 4 × 5 = 20.

2 4 pens cost $20. What do 7 pens cost, in dollars?

Answer: 35

One pen costs 20 ÷ 4 = 5, so 7 pens cost 5 × 7 = 35.

3 5 pens cost $35. What do 8 pens cost, in dollars?

Answer: 56

One pen costs 35 ÷ 5 = 7, so 8 pens cost 7 × 8 = 56.

4 6 pens cost $18. What do 10 pens cost, in dollars?

Answer: 30

One pen costs 18 ÷ 6 = 3, so 10 pens cost 3 × 10 = 30.

5 2 pens cost $9. What do 6 pens cost, in dollars?

Answer: 24

One pen costs 9 ÷ 2 = 4, so 6 pens cost 4 × 6 = 24.

6 8 pens cost $24. What do 5 pens cost, in dollars?

Answer: 15

One pen costs 24 ÷ 8 = 3, so 5 pens cost 3 × 5 = 15.

7 7 pens cost $63. What do 4 pens cost, in dollars?

Answer: 36

One pen costs 63 ÷ 7 = 9, so 4 pens cost 9 × 4 = 36.

8 9 pens cost $45. What do 6 pens cost, in dollars?

Answer: 30

One pen costs 45 ÷ 9 = 5, so 6 pens cost 5 × 6 = 30.

9 10 pens cost $65. What do 4 pens cost, in dollars?

Answer: 24

One pen costs 65 ÷ 10 = 6, so 4 pens cost 6 × 4 = 24.

10 12 pens cost $96. What do 3 pens cost, in dollars?

Answer: 24

One pen costs 96 ÷ 12 = 8, so 3 pens cost 8 × 3 = 24.

11 4 identical bags hold 200 g altogether. How much do 6 bags hold, in grams?

Answer: 300

One bag holds 200 ÷ 4 = 50 g, so 6 bags hold 300 g.

12 5 identical bags hold 150 g altogether. How much do 8 bags hold, in grams?

Answer: 240

One bag holds 150 ÷ 5 = 30 g, so 8 bags hold 240 g.

13 3 identical bags hold 180 g altogether. How much do 7 bags hold, in grams?

Answer: 420

One bag holds 180 ÷ 3 = 60 g, so 7 bags hold 420 g.

14 6 identical bags hold 240 g altogether. How much do 4 bags hold, in grams?

Answer: 160

One bag holds 240 ÷ 6 = 40 g, so 4 bags hold 160 g.

15 8 identical bags hold 320 g altogether. How much do 5 bags hold, in grams?

Answer: 200

One bag holds 320 ÷ 8 = 40 g, so 5 bags hold 200 g.

16 2 identical bags hold 90 g altogether. How much do 9 bags hold, in grams?

Answer: 405

One bag holds 90 ÷ 2 = 45 g, so 9 bags hold 405 g.

17 y is directly proportional to x. When x = 2, y = 10. What is y when x = 6?

Answer: 30

y ÷ x is always 5, so when x = 6, y = 6 × 5 = 30.

18 y is directly proportional to x. When x = 3, y = 21. What is y when x = 9?

Answer: 63

y ÷ x is always 7, so when x = 9, y = 9 × 7 = 63.

19 y is directly proportional to x. When x = 4, y = 36. What is y when x = 12?

Answer: 108

y ÷ x is always 9, so when x = 12, y = 12 × 9 = 108.

20 y is directly proportional to x. When x = 5, y = 40. What is y when x = 15?

Answer: 120

y ÷ x is always 8, so when x = 15, y = 15 × 8 = 120.

21 y is directly proportional to x. When x = 3, y = 12. What is y when x = 21?

Answer: 84

y ÷ x is always 4, so when x = 21, y = 21 × 4 = 84.

B · Reasoning — When proportion is direct, and when not.

22 What does **directly proportional** mean?

- ☐ One goes up as the other goes down
- ☐ When one doubles, so does the other
- ☐ They are equal
- ☐ They add to a fixed total

Answer: When one doubles, so does the other

The ratio between them stays the same.

23 What is the **unitary method**?

- ☐ Finding the total
- ☐ Finding the value of one, then scaling up
- ☐ Adding the parts
- ☐ Dividing by two

Answer: Finding the value of one, then scaling up
Almost every proportion question yields to it.

24 5 pens cost $35. What is the first step to find the cost of 8?

- ☐ Multiply 35 by 8
- ☐ Divide 35 by 5 to find one pen
- ☐ Add 3 to 35
- ☐ Divide 8 by 5

Answer: Divide 35 by 5 to find one pen
One pen is $7, so 8 cost $56.

25 A graph of two directly proportional quantities ...

- ☐ curves upwards
- ☐ is a straight line through the origin
- ☐ is horizontal
- ☐ is a straight line not through the origin

Answer: is a straight line through the origin
Zero of one gives zero of the other — the link back to Unit 11.

26 Is the cost of petrol directly proportional to the number of litres?

- ☐ Yes
- ☐ No

Answer: Yes
Twice as many litres costs twice as much, and zero litres costs nothing.

27 Is a taxi fare directly proportional to the distance?

- ☐ Yes
- ☐ No

Answer: No
There is usually a fixed charge, so zero distance still costs something. The graph does not pass through the origin.

28 If 3 workers take 6 hours, how long would 6 workers take, assuming they work at the same rate?

- ☐ 12 hours
- ☐ 6 hours
- ☐ 3 hours
- ☐ It cannot be found

Answer: 3 hours
More workers means less time — this is **inverse** proportion, not direct. Doubling the workers halves the time.

29 How can you tell whether two quantities are directly proportional from a table?

- ☐ The values increase
- ☐ Dividing one by the other always gives the same number
- ☐ They add to a constant
- ☐ You cannot tell

Answer: Dividing one by the other always gives the same number
That constant is the rate.

C · Challenge — Awkward numbers and working back.

30 7 books cost $91. What do 11 books cost, in dollars?

Answer: 143
One book is 91 ÷ 7 = 13, and 13 × 11 = 143.

31 A recipe for 4 people uses 300 g of rice. How much for 10 people, in grams?

Answer: 750
One person needs 75 g, and 75 × 10 = 750 g.

32 A car uses 12 litres for 96 km. How far on 20 litres, in km?

Answer: 160
96 ÷ 12 = 8 km per litre, and 8 × 20 = 160 km.

33 9 identical tiles weigh 45 kg. How many tiles weigh 30 kg?

Answer: 6
One tile is 5 kg, and 30 ÷ 5 = 6 tiles.

34 3 machines fill 240 bottles an hour. How many do 7 machines fill in an hour?

Answer: 560
One machine fills 80, and 80 × 7 = 560.

35 A wall of 8 m^2 needs 2 litres of paint. How many m^2 will 7 litres cover?

Answer: 28
One litre covers 4 m^2, and 4 × 7 = 28.

D · Word problems — Prices, fuel, recipes and maps.

36 4 apples cost $6. What do 10 apples cost, in dollars?

Answer: 15
One apple is $1.50, and 1.50 × 10 = 15.

37 A car travels 150 km on 10 litres. How far on 4 litres, in km?

Answer: 60
15 km per litre, so 60 km.

38 5 tickets cost $40. What do 9 tickets cost, in dollars?

Answer: 72
One ticket is $8, and 8 × 9 = 72.

39 A recipe for 6 uses 450 g of flour. How much for 8, in grams?

Answer: 600
75 g each, and 75 × 8 = 600.

40 A printer does 240 pages in 8 minutes. How many in 15 minutes?

Answer: 450

30 pages a minute, and 30 × 15 = 450.

41 A tap fills 90 litres in 6 minutes. How long to fill 240 litres, in minutes?

Answer: 16

15 litres a minute, and 240 ÷ 15 = 16.

42 3 kg of rice feeds 24 people. How many does 5 kg feed?

Answer: 40

8 people per kg, and 8 × 5 = 40.

43 A map scale means 4 cm represents 10 km. What does 14 cm represent, in km?

Answer: 35

2.5 km per cm, and 2.5 × 14 = 35.