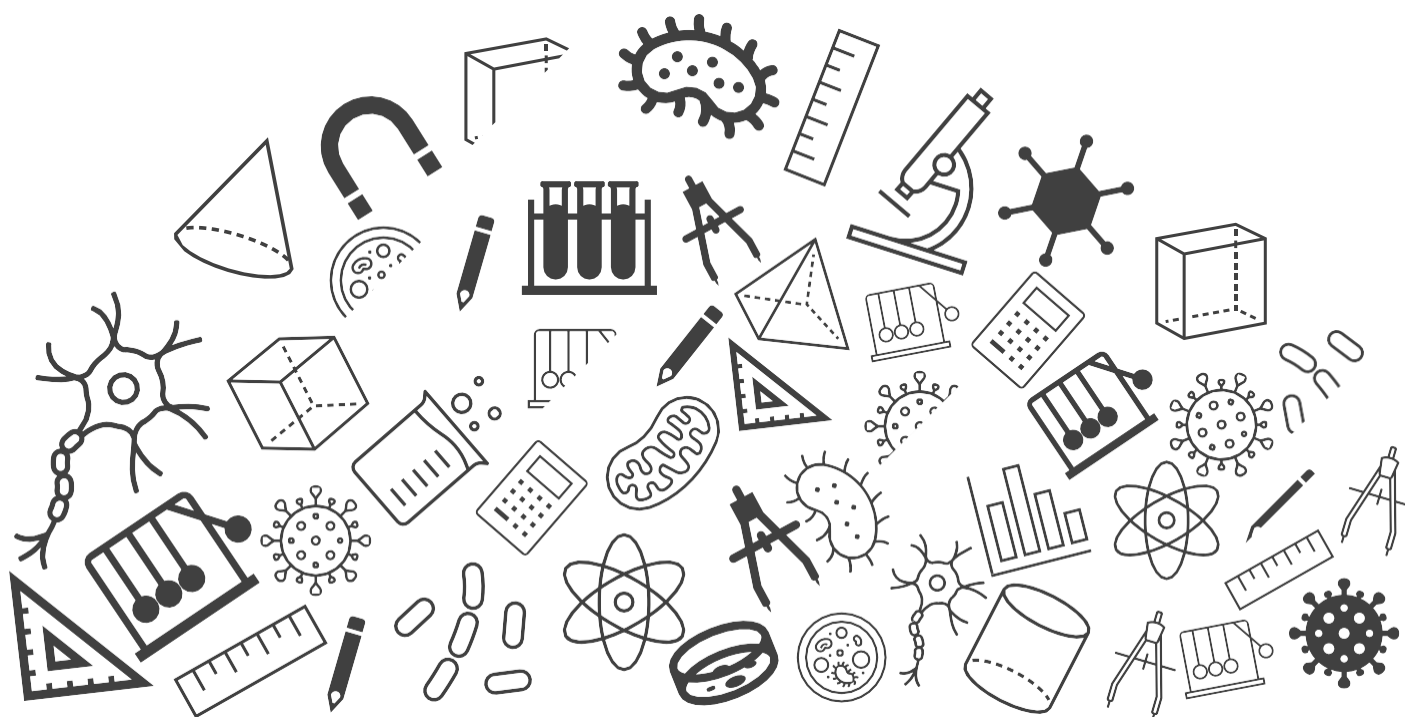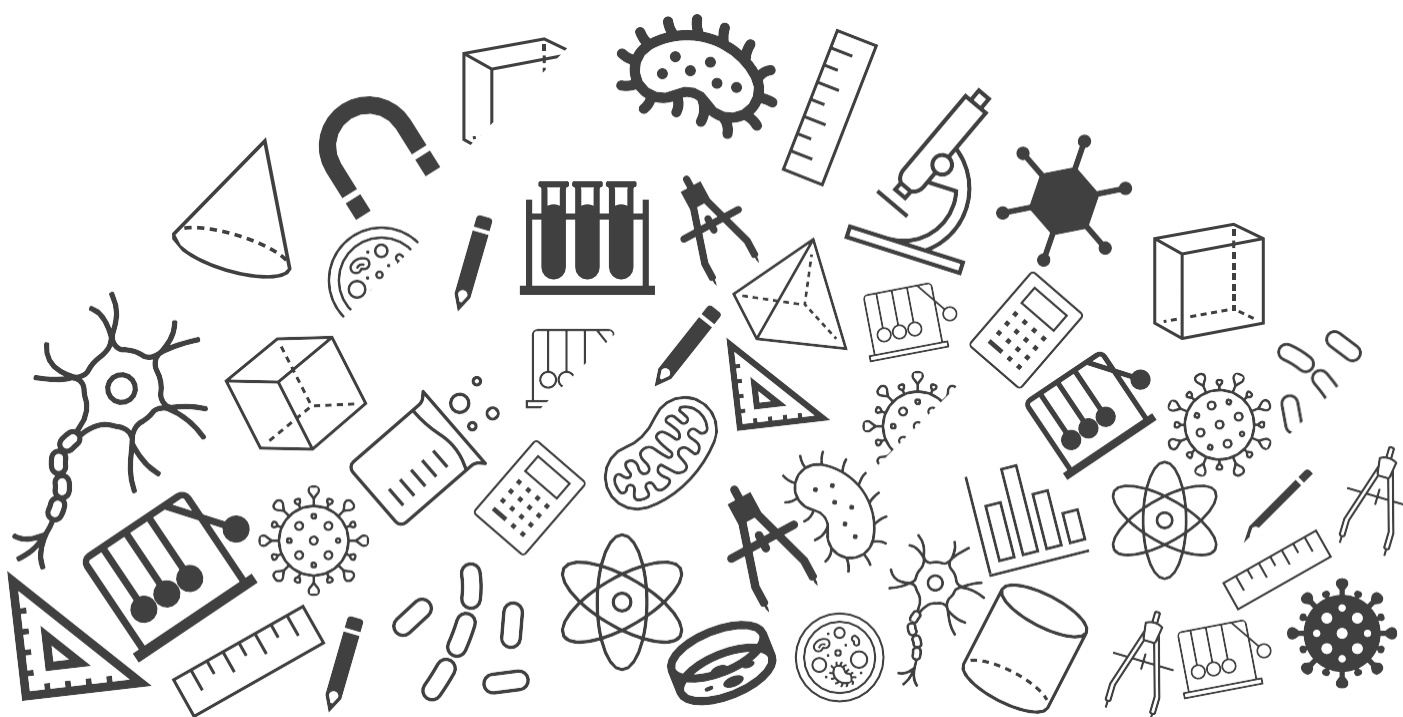# BYJU'S

Grade 08: Maths
Exam Important Questions

BYJU'S

Direct and Inverse Proportions

Direct and Inverse Proportions

1. A ladder of height 15 m casts a shadow of 12 m and a nearby tree casts a shadow of 14 m. Find the height of the tree assuming that the data is collected at the same place and at the same time.

   ✗ **A.** 17 m

   ✗ **B.** 14 m

   ✓ **C.** 17.5 m

   ✗ **D.** 14.5 m

   Comparing the data of the ladder and the tree, the ratio is deduced considering the height of the tree to be taken as x.

   The ratio comes out to be $\frac{15}{12} = \frac{x}{14}$

   $\implies x = \frac{14 \times 15}{12}$

   Solving, we get the height of tree to be 17.5 m.

Direct and Inverse Proportions

2.

40 bags of cotton cost ₹ 2,200. But by exchanging 25 bags to the shopkeeper, we get 30 grams of silver. Find the price of 150 grams of silver by exchanging relevant number of cotton bags.

- ✔ **A.** ₹ 6,875
- ✘ **B.** ₹ 6,675
- ✘ **C.** ₹ 6,575
- ✘ **D.** ₹ 6,975

In this question, we need to use the direct proportion twice.

First, we need to find the price of 25 bags for exchanging silver. That can be found out by applying direct proportion.

$$\frac{2200}{40} = \frac{x}{25}$$

x = ₹ 1,375

This value of x gives the price of 30 grams of silver.

To find the price of 150 grams of silver, we apply direct proportion again.

$$\frac{30}{1375} = \frac{150}{y}$$

$\implies$ y = ₹ 6,875

3. 39 men can build a bridge in 12 days, working 5 hours a day. In how many days will 30 men, working 6 hours a day, complete the work?

- ✗ **A.** 10
- ✔ **B.** 13
- ✗ **C.** 14
- ✗ **D.** 15

Let the required number of days with 30 men working for 6 hours be x.

Number of men	39	30
Number of hours	5	6
Number of days	12	x

Number of men, number of hours and number of days are inversely proportional and work done is constant in both the cases, hence

$$\Rightarrow 39 \times 12 \times 5 = 30 \times \ x \ \times 6$$

$$x = \frac{39 \times 12 \times 5}{30 \times 6}$$

$$x = 13 \text{ days}$$

4. A train is 32 meters long. If its model is 10 centimeters high and 1 meter long, then how high is the train?

✔ **A.** 3.2 meters

✘ **B.** 4.2 meters

✘ **C.** 3.6 meters

✘ **D.** 4.8 meters

Given,
1 meter (100 centimeters) of the model is equivalent to 32 meters in actual.

We know that lesser is the measurement in the model, lesser is the actual measurement.

So, Model measurements (x)
$\qquad \propto$ Actual measurements (y)

$\therefore \ \frac{x_1}{y_1} = \frac{x_2}{y_2}$

Given,
$x_1 = 100$ cm
$y_1 = 32$ m
$x_2 = 10$ cm
and $y_2 = $ actual height
$\Rightarrow y_2 = \frac{x_2 \times y_1}{x_1}$
$\Rightarrow y_2 = \frac{10 \times 32}{100} = 3.2$ m

Hence, the actual height of the train is 3.2 meters.

5.

There are 8 pipes which take 26 hours to fill a big drum. But when the operations were supposed to begin, two pipes were damaged. It so happened that only one could be retreived back to usable state. What will be the time taken to fill the drum with the existing pipes?

- ✔ **A.** 29.7 hours
- ✘ **B.** 30.7 hours
- ✘ **C.** 28.7 hours
- ✘ **D.** 27.7 hours

According to the given information in the question, we infer that there are 7 pipes that can be used to fill the drum.

If the time taken by 7 pipes to fill the drum is taken as t, the equation would be 7 × t = 8 × 26 (since time is inversely proportional to the number of pipes).

$\therefore$ t = 29.7 hrs

6. A 5 m 60 cm high vertical pole casts a shadow 3 m 20 cm long. Find at the same time:
   1. the length of the shadow cast by another pole 10 m 50 cm high
   2. the height of a pole which casts a shadow 5m long.

   [3 marks]

First, we will convert the units of all measurements to metres.

We know that, $1 \ m = 100 \ cm$

$\Rightarrow 5 \ m \ 60 \ cm = 5 \ m + 0.6 \ m = 5.6 \ m$

$\Rightarrow 3 \ m \ 20 \ cm = 3 \ m + 0.2 \ m = 3.2 \ m$

$\Rightarrow 10 \ m \ 50 \ cm = 10 \ m + 0.5 \ m = 10.5 \ m$

(i) Now, the $5.6 \ m$ vertical pole casts a $3.2 \ m$ long shadow. If there is another pole, whose height is $10.5 \ m$ then the length of its shadow will increase as the length of the vertical pole is also increased.

Hence, the height of the pole and length of the shadow are in direct proportion.

Let the length of the shadow of another pole be $x \ m$.

$\Rightarrow \frac{5.6 \ m}{3.2 \ m} = \frac{10.5 \ m}{x \ m}$
$\Rightarrow x = \frac{10.5 \ m \times 3.2 \ m}{5.6 \ m} = \frac{33.6 \ m}{5.6 \ m} = 6 \ m$

Hence, the length of the shadow cast by another pole is $6 \ m$.

[1.5 marks]

(ii) Since, the height of the pole and length of the shadow are in direct proportion.

Let the height of the pole be $y \ m$ which casts a shadow of $5 \ m$.

$\Rightarrow \frac{5.6 \ m}{3.2 \ m} = \frac{y \ m}{5 \ m}$
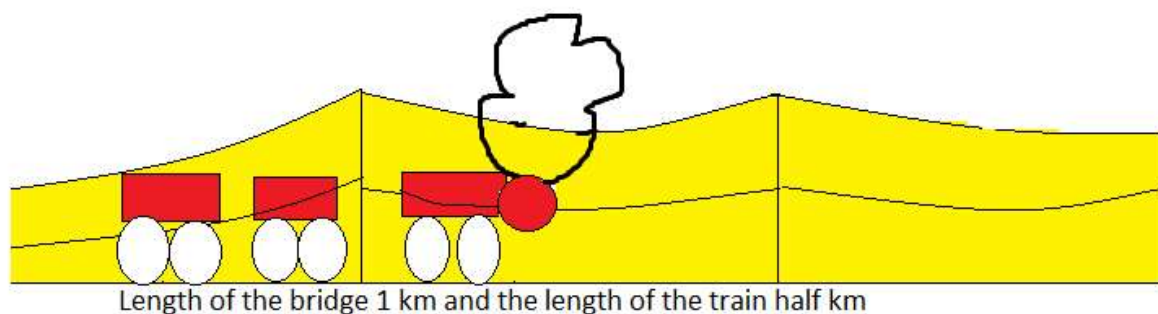$\Rightarrow y = \frac{5.6 \ m \times 5 \ m}{3.2 \ m} = \frac{28 \ m}{3.2 \ m} = 8.75 \ m$

Hence, the height of the pole which casts a shadow of $5 \ m$ is $8.75 \ m$.

[1.5 marks]

7. A man sees a train passing a bridge 1 km long. The length of the train is half that of the bridge. If the train clears the bridge in 2 minutes, find the speed of the train in km/hr. **[3 marks]**

Length of the bridge 1 km and the length of the train half km

According to the given condition

The total distance thats needs to be covered by the train to cross the bridge $= \frac{1}{2} + 1$

$$= \frac{1+2}{2}$$

$$= \frac{3}{2} km$$

[1 marks]

Given that the time taken = 2 minutes when converting into hour we have $\frac{2}{60} = \frac{1}{30} hr$

[0.5 marks]

If the distance covered by the train = x km

we have

Distance covered	time taken
$\frac{3}{2} kms$	$\frac{1}{30} hr$
$x \ km$	$1 hr$

[1 mark]

Cross multiplying we have

$\frac{3}{2} \times 1 = x \times \frac{1}{30}$

$\frac{3}{2} = \frac{x}{30}$

$45 = x$

Hence the speed of the train = 45 km/hr

[0.5 marks]

Direct and Inverse Proportions

8.

The management of a college decides to paint the college auditorium and observes that 16 workers can paint it in 10 days. How many workers are needed to complete the work in 4 days? [2 MARKS]

Concept: 1 Mark
Solution: 1 Mark

As the number of workers increase, the number of days required for the work to be completed decreases. This is an inverse proportion condition. So,

Let the required number of days be n

$$16 \times 10 = 4 \times n$$

$$n = 40$$

So, 40 workers are required to finish the work in 4 days.

9.

Consider the equation x(y + 1) = x + 3 . Check whether x is directly or inversely proportional to y. [3 MARKS]

Statement of conditions for proportionality: 1 Mark
Solution: 2 Marks

We know that the condition for direct proportion is $\frac{x}{y} = constant$
and the condition for inverse proportion is xy = constant

Expanding the given equation we have,

xy + x = x + 3

xy = 3

So, x is inversely proportional to y.

10.

Rehman is making a wheel using spokes. He wants to fix equal spokes in such a way that the angles between any pair of consecutive spokes are equal.

(i) Are the number of spokes and the angles formed between the pairs of consecutive spokes in inverse proportion?

(ii) Calculate the angle between a pair of consecutive spokes on a wheel with 15 spokes.

(iii) How many spokes would be needed, if the angle between a pair of consecutive spokes is $40°$?

Number of spokes	4	6	8	10	12
Angle between a pair of consecutive spokes(In degrees)	90	60			

[3 MARKS]

Solution: 1 Mark each

Here the constant $k = 4 \times 90° = 360°$

Hence, Angle for 8 spokes
$= \frac{(360°)}{8} = 45°$

Angle for the 10 spokes
$= \frac{(360°)}{10} = 36°$

Angle for the 12 spokes
$= \frac{(360°)}{12} = 30°$

i) With increasing number of spokes the angle is decreasing so they are in inverse proportion.

ii) $\frac{360}{15} = 24°$ is the angle between the spokes.

iii) $\frac{(360°)}{Spokes} = 40°$

$\Rightarrow spokes = \frac{360°}{40°} = 9$