7th Basic

8th Advanced

# Helping With Math

USA GRADES

## Box Plots (Box and Whisker Plots)

*Suitable for students* **aged 11-13**

This pack is suitable for learners aged 11-13 years old or 7th and 8th graders (USA). The content covers fact files and relevant basic and advanced activities involving box and whisker plots.

What is a ***box plot***?

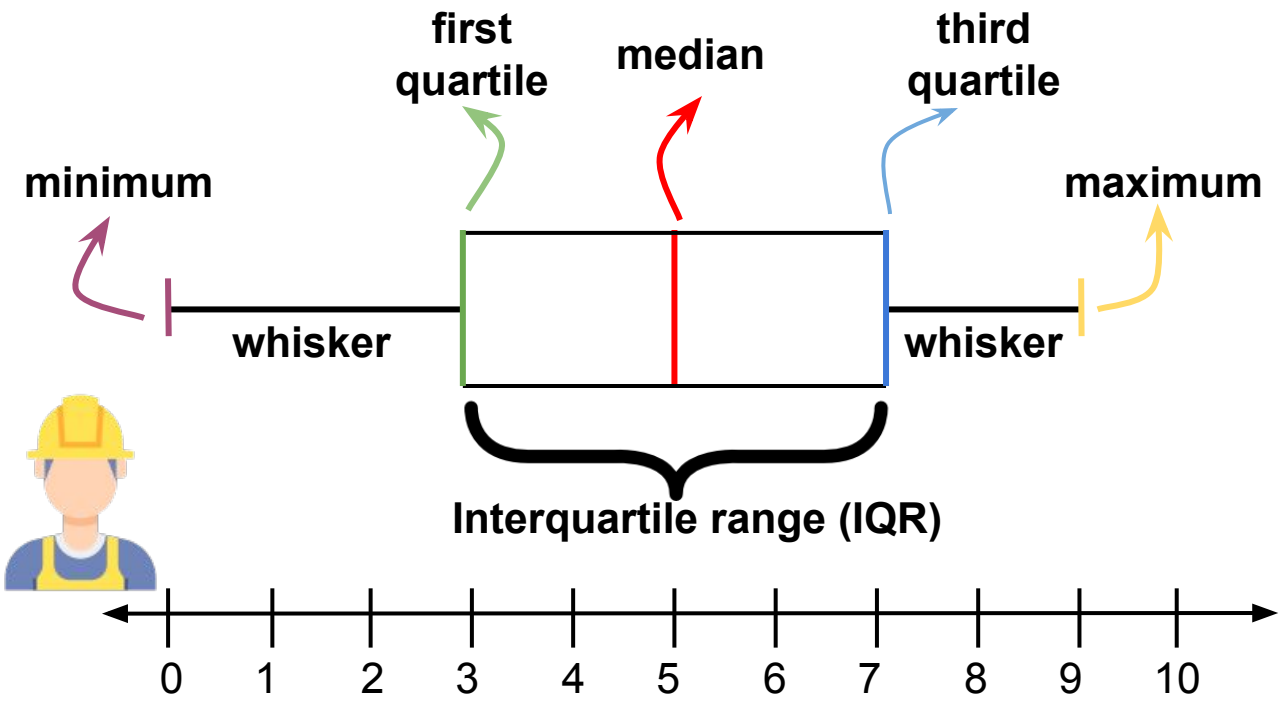
- A box plot is also called box and whisker plots.
- It is a type of graph that displays variation in a data set.
- It displays the five-number summary: minimum, first quartile, median, third quartile and maximum.

Hi! Today we'll learn how to construct box-whisker plots!

What are the uses of ***box and whisker plots***?

- Used in comparing data from different categories for easier and more effective decision-making.
- Used to provide a visual summary of the data enabling researchers to quickly identify mean values, the dispersion of the data set, and signs of skewness.

# PARTS OF A BOX-WHISKER PLOT




MEDIAN (Q2/50th Percentile):
The middle value of the dataset.

INTERQUARTILE RANGE:
25th to the 75th percentile

FIRST QUARTILE
(Q1/25th Percentile):
The middle number between the smallest number and the median of the dataset.

THIRD QUARTILE
(Q2/75th Percentile):
The middle value between the median and the highest value of the dataset.

MINIMUM
The smallest number in the dataset located at the end of the left whisker.

MAXIMUM
The largest number in the dataset located at the end of the right whisker.

# STEPS ON HOW TO CONSTRUCT A BOX-WHISKER PLOT

The following data are the number of construction workers who worked for 10 consecutive days. Determine the percentage that the number of workers is greater than 16.

15, 18, 10, 21, 13, 24, 27, 11, 14, 20

## STEP 1

Arrange the given data from smallest to largest.

10, 11, 13, 14, 15, 17, 20, 21, 24, 27

## STEP 2

Find the median of the given data set. Note that the median is the mean of the middle two numbers.

$$\frac{15 + 17}{2} = \mathbf{16}$$

## STEP 3

Find the quartiles.

The first quartile (Q1)is the median of the data points to the left of the median.

Q1: 10, 11, **13**, 14, 15,

The third quartile (Q3) is the median of the data points to the right of the median.

Q3: 17, 20, **21**, 24, 27

## STEP 4

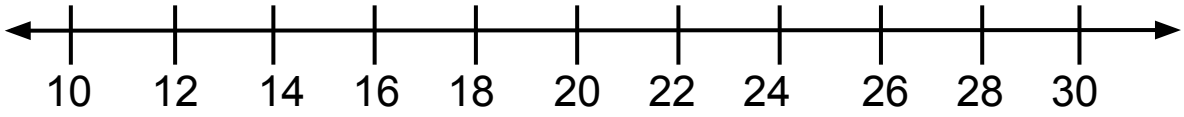
Identify the minimum and maximum to complete the five-number summary.

Minimum: **10**
Maximum: **27**

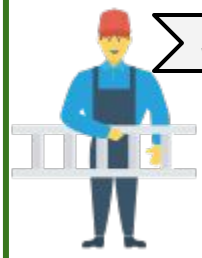
# STEPS ON HOW TO CONSTRUCT A BOX-WHISKER PLOT

**STEP 5**

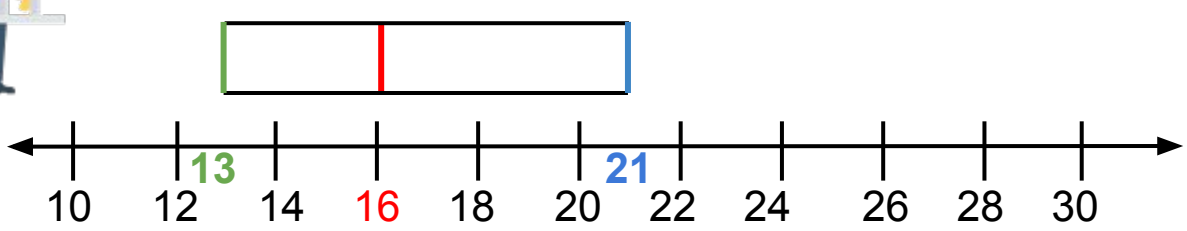
Create a Line Plot. Scale and label it that fits the five-number summary.




**STEP 6**

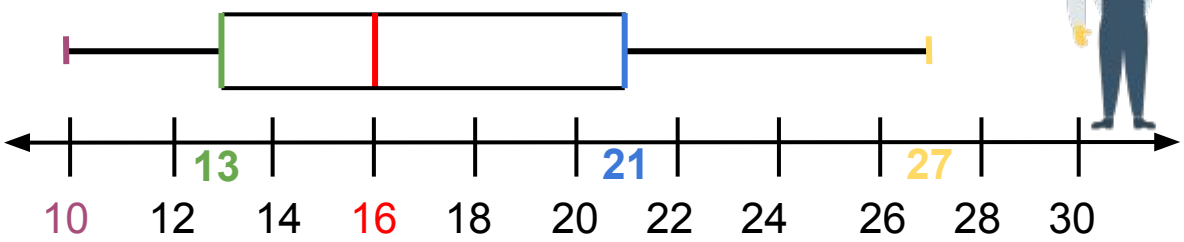


Create a box above the line plot from Q1 to Q3. Draw a vertical line through a median.



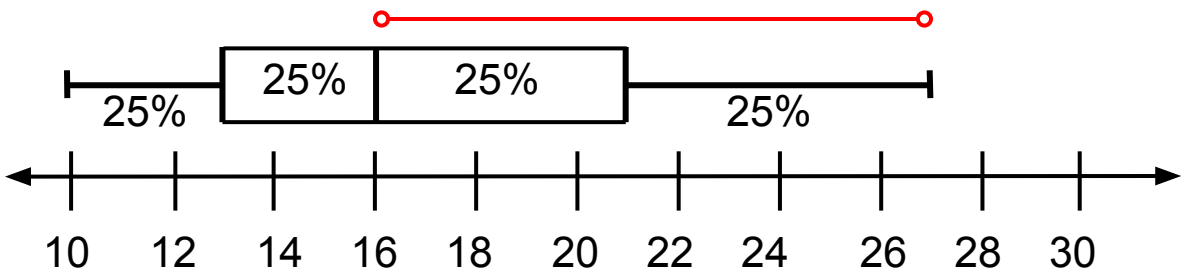

**STEP 7**

The last step is to draw a whisker from Q1 to the minimum value and from Q3 to the maximum value.




**INTERPRETATION:**

25% + 25% = *50% that the number of the workers is greater than or equal to 16.*



# TABLE OF ACTIVITIES


| | | |
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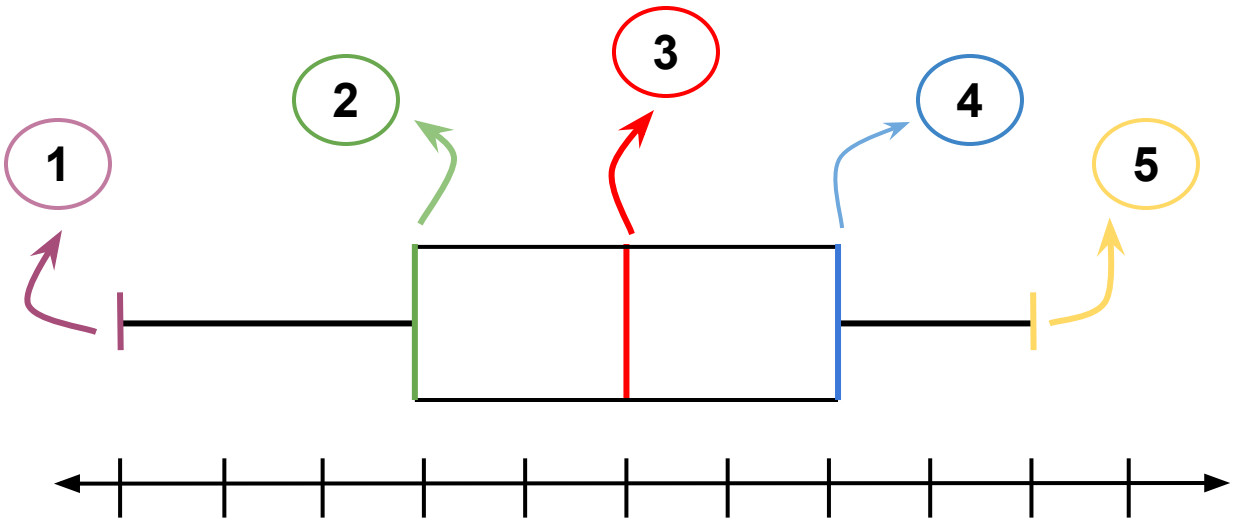
| **Ages 11-12** (Basic) | | 7th Grade |
| 1 | Architect | |
| 2 | Construction Engineer | |
| 3 | My Own Construction Company | |
| 4 | Paolo the Drafter | |
| 5 | Gift to the Workers | |
| **Ages 12-13** (Advanced) | | 8th Grade |
| 6 | Materials Engineer | |
| 7 | Build, Build, Build | |
| 8 | Lead Foreman | |
| 9 | Construction Project | |
| 10 | Head of Construction | |

# ARCHITECT

G7 Basic

**You're an architect in one of the best known construction firms in your city. You are tasked to label the parts of the box-whisker plot below in order for you to start your new project. Write your answers on the space provided.**

## PARTS OF A BOX-WHISKER PLOT




1.)

2.)

3.)

4.)

5.)

# CONSTRUCTION ENGINEER

G7 Basic

**Janna is a construction engineer. She needs to identify the following in order for her to finish her project. Help her by answering the following. Write your answers on the space provided.**

1. It is located at the end of the left whisker.

2. It is the middle number between the smallest number and the median of the dataset.

3. It is the middle value of the dataset.

4. It is located at the end of the right whisker.

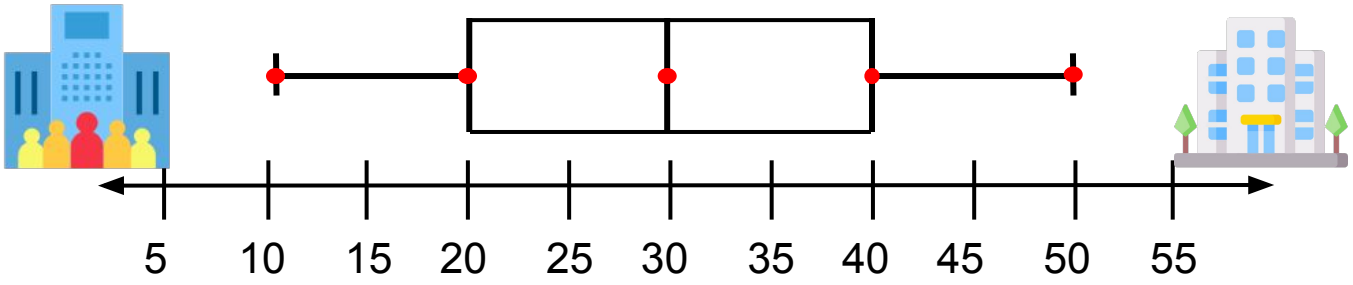
5. It is the middle value between the median and the highest value of the dataset.

# MY OWN CONSTRUCTION COMPANY

G7
Basic

**Gino is planning to have a construction company next year. Help him answer the problem below to know whether it is feasible to put up a construction company next year. Write your answers on the space provided.**

The box-whisker plot presented below shows the number of construction companies established since 2011.




1.) What is the first quartile value?

2.) What is the third quartile value?

3.) What is the upper extreme/maximum?

4.) What is the lower extreme/minimum?

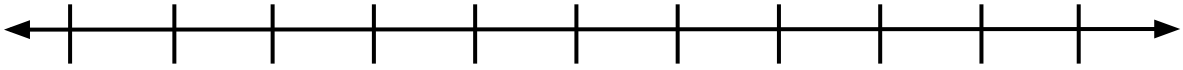
5.) What is the median value?

# PAOLO THE DRAFTER

G7 Basic

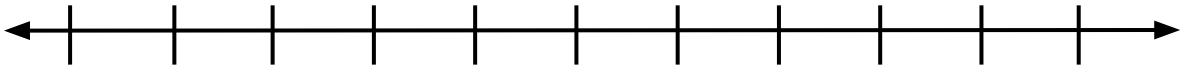
**Paolo is a drafter in a construction firm. He has a task that needs to be finished as soon as possible. Help him finish his task by constructing a box-whisker plot based on the given data below.**

**1**



| | | |
|---|---|---|
| Minimum: 22 | First Quartile: 26 | Median: 30 |
| Maximum: 38 | Third Quartile: 34 | |

**2**



| | | |
|---|---|---|
| Minimum: 10 | First Quartile: 14 | Median: 18 |
| Maximum: 26 | Third Quartile: 22 | |

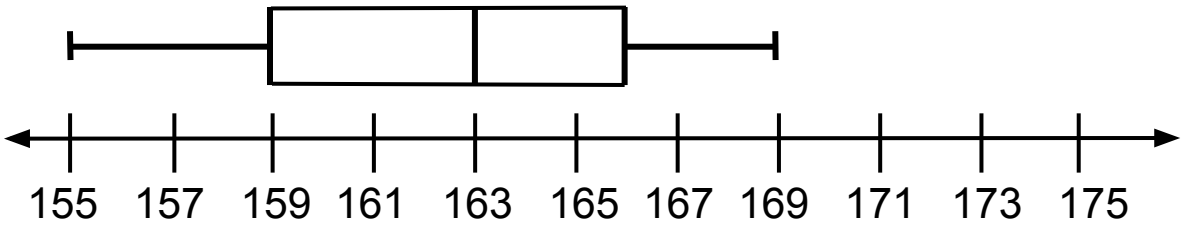
# GIFT TO THE WORKERS

G7
Basic

**The company management will be giving gifts to all construction workers. In line with this, the management would like to know the height of the workers. Help them by analyzing the box-whisker plot below. Write your answers on the space provided.**

The box-whisker plot below represents the height (in cm) of the construction workers of a construction company. Based on the plot, answer the following questions below.

Height of the Construction Workers (in cm)




1.) What is the Q1 and Q3 of the data set?

2.) What is the median height of the workers?

3.) What is the lowest height of the workers?

4.) What percentage of the workers who are above 163 cm?

5.) What percentage of the workers who are below 159 cm?

6.) What percentage of the workers who are below 166 cm?

# MATERIALS ENGINEER

G8 Advanced

**Sarah is a materials engineer. She needs to choose what type of material best suits her next building project. Help her choose the materials by choosing the correct box-whisker plot for the given set of data. Write the letters of your answer on the space provided.**

**1.)** ____

12, 16, 19, 21, 24, 28

**2.)** ____

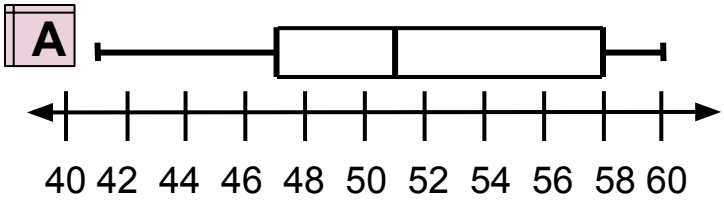
11, 15, 16, 18, 20, 29

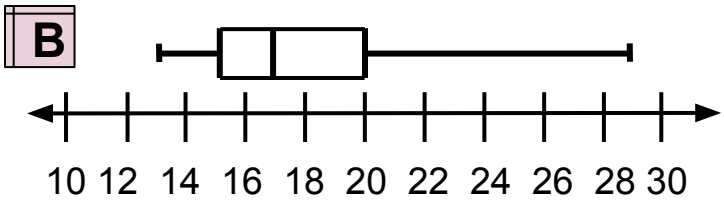
**3.)** ____

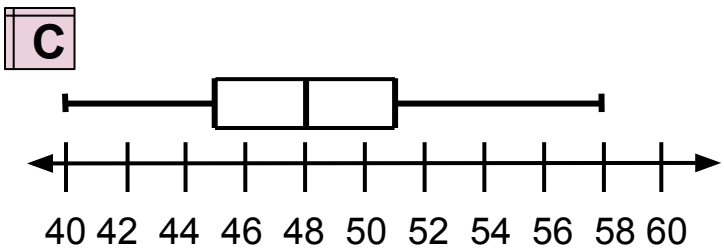
41, 47, 50, 52, 58, 60

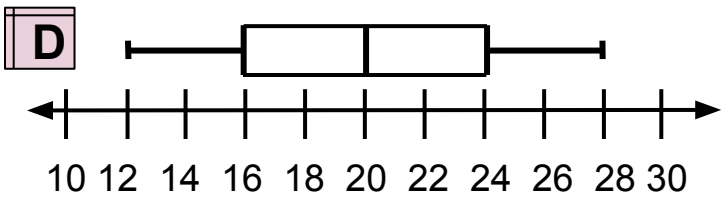
**4.)** ____

40, 45, 46, 50, 51, 58



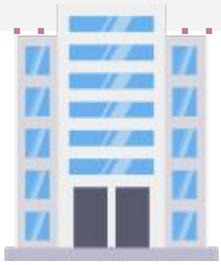



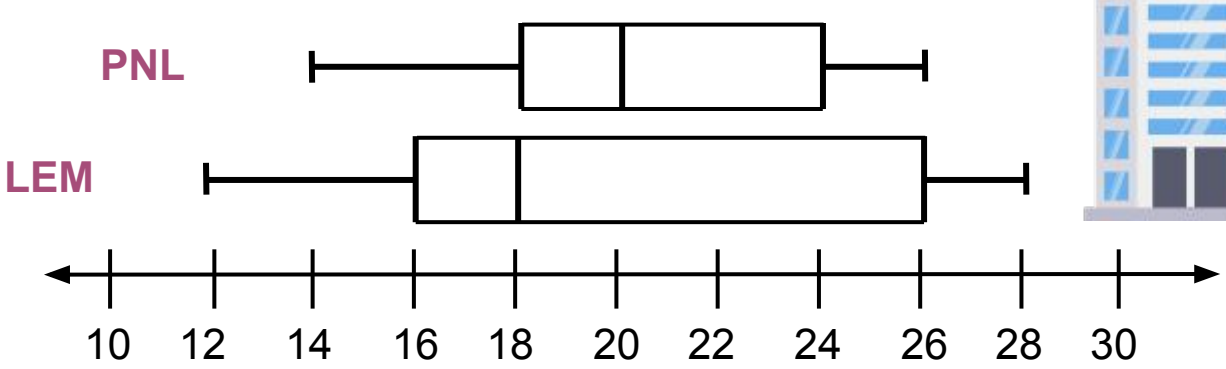
# BUILD, BUILD, BUILD

G8 Advanced

**Yna plan to build a 5-floor building and she is looking for a construction company to manage the building of the structure. Her options are PNL and LEM Construction company. Help her choose between the two by analyzing the problem below. Write your answers on the space provided.**

The box-whisker plot below shows the number of structures built by PNL construction company and LEM construction company since the year they started their operations. Based on the box-whisker plot, give 5 interpretations regarding the graph presented.






1

2

3

4

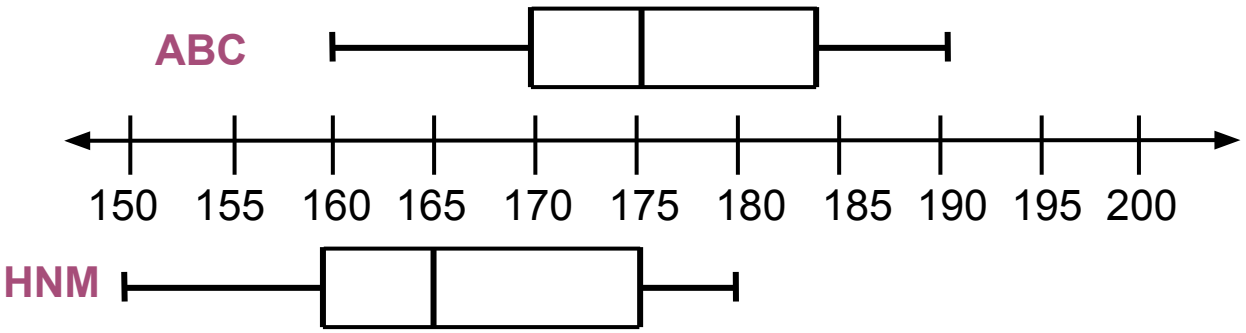
5

# LEAD FOREMAN

G8 Advanced

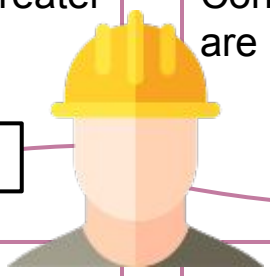
**John submitted his application to become a lead foreman in his company. He needs to accomplish some examinations to qualify for the position. Help him pass his exam by determining whether the statements below are true or false. Write "TRUE" in the box if the statement is correct otherwise, write "FALSE".**

The box-whisker plot below shows the height (in cm) of the employees of the ABC Construction Firm and the HNM Construction Firm. Based on the plot, determine if the the given statements are right or wrong. Justify your answer.




1.) 75% of the ABC Construction Firm's employees are greater than 170 cm.

2.) Half of the HNM Construction Firm's employees are less than 160 cm.



3.) The shortest employee comes from ABC Construction Firm.

4.) 25 % of he HNM Construction Firm's employees are greater than 175 cm.

# CONSTRUCTION PROJECT

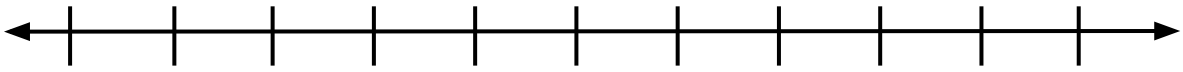
G8 Advanced

**Help Gelo finish his construction project by constructing a box-whisker plot based on the given set of data. Determine the value of the following and write your answer on the space provided.**

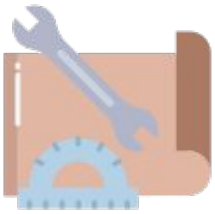
The following data are the number of employees JNG Construction Firm has for its 11 years operation.

120, 125, 140, 135, 140, 150, 145, 160, 165, 170,

1.) Construct a box-whisker plot



Determine the value of the following:



2.) Minimum: _____

3.) Maximum: _____

4.) 1st Quartile: _____

5.) 3rd Quartile: _____

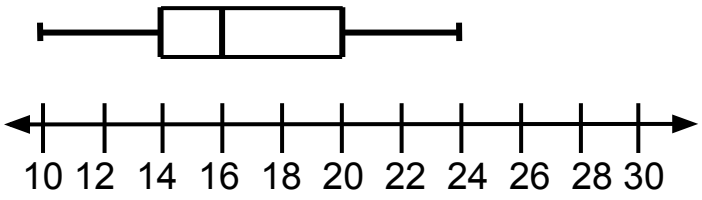
6.) Median: _____

# HEAD OF CONSTRUCTION

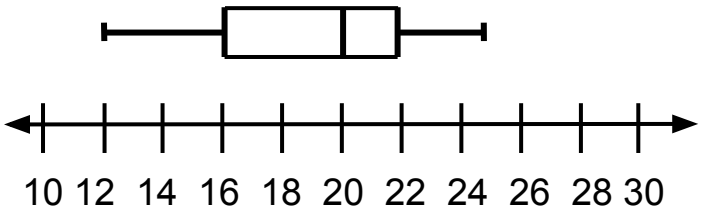
G8 Advanced

**As the head of the construction in your company, you are assigned to answer the following problems. Based on the given box-whisker plots, give a possible set of data. Write your answers on the space provided.**

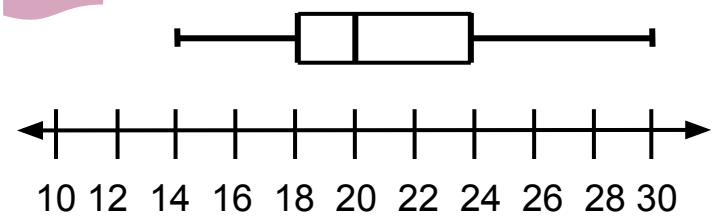
**1**



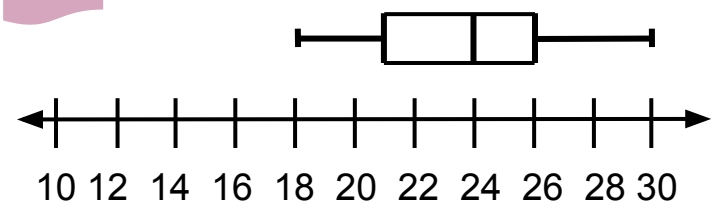
**2**




**3**



**4**



# ANSWER GUIDE

## Activity 1

1.) Minimum 2.) First quartile 3.) Median 4.) Third quartile
5.) Maximum

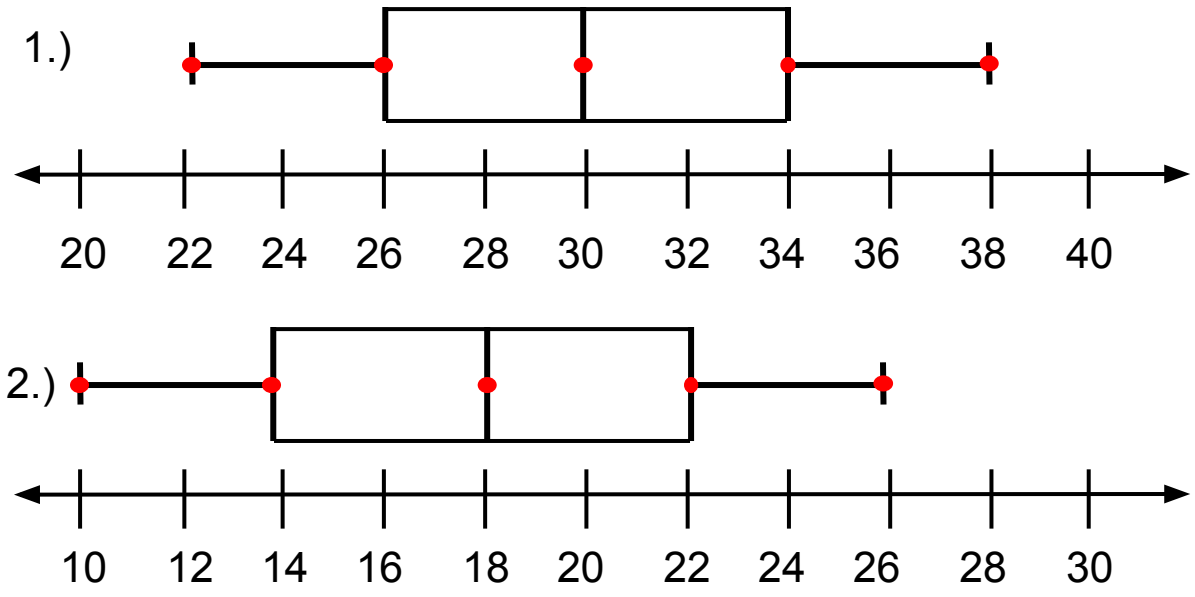
## Activity 2

1.) Minimum 2.) First quartile 3.) Median 4.) Maximum
5.) Third quartile

## Activity 3

1.) 20 2.) 40 3.) 50 4.) 10 5.) 30

## Activity 4



# ANSWER GUIDE

## Activity 5

1.) 159&166 2.) 163 cm 3.) 155 cm 4.) 50% 5.) 25% 6.)75%

## Activity 6

1.) D 2.) B 3.) A 4.) C

## Activity 7

Possible Answers:
1.) 50% of LEM construction company's operating years built less than 18 structures.
2.) The highest number of structures built by PNL construction company is 26.
3.) The highest number of structures built by LEM construction company is 28.
4.) 75% of PNL construction company's operating years built more than 18 structures.
5.) 25% of LEM construction company's operating years built more than 24 structures.

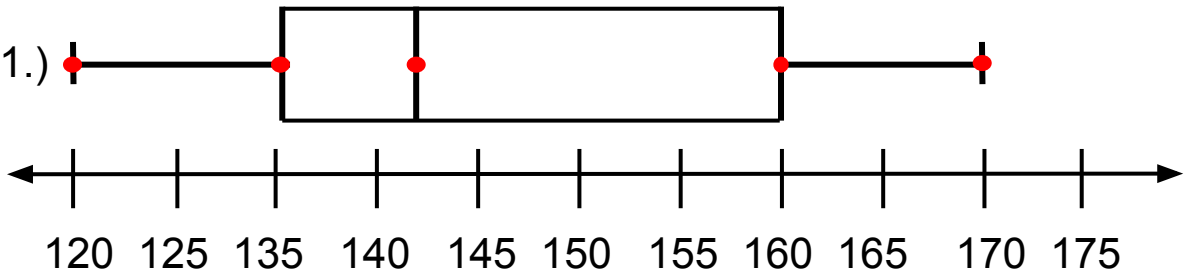
## Activity 8

1.) TRUE; 25% + 25% + 25% = 75%
2.) FALSE; As we can see in the plot, 25% of the employees are less than 160cm.
3.) FALSE; The shortest employee comes from HNM Firm with a height of 150cm.
4.) TRUE; As we can see in the plot, 25%of the employees are greater than 175cm.

# ANSWER GUIDE

## Activity 9

1.)




2.) 120
3.) 135
4.) 170
5.) (140+145)/2 = **142.5**

## Activity 10

Possible answers:
1.) 10, 14, 16,16, 20, 24
2.) 12, 16, 19, 21, 22, 25
3.) 14, 18, 18, 22, 24, 30
4.) 18, 21, 22, 26, 26 30

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